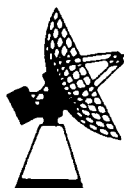


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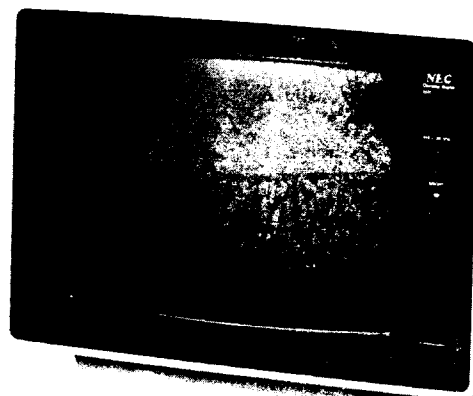
MODEL JC-1203DHE

12" COLOR CHARACTER DISPLAY UNIT SERVICE MANUAL

ORDER NO. 599910206



Better Service
Better Reputation
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SPECIFICATIONS

Picture Tube . . . 320CGB22 12" diagonal & 76° deflection
Dot type black matrix

Input Signal R.G.B. direct drive system

Video Signal TTL level, Positive

Vertical Sync. TTL level, Negative/Positive
(Switchable)

Horizontal Sync. TTL Level, Negative/Positive
(Switchable)

Intensity TTL level

Input Terminal 8-pin Connector

Scanning Frequency:

Horizontal 15.75 kHz (63.5 μ S)

Vertical 60 Hz (16.67 ms) 50 Hz (20.0 ms)

Active Video Period:

Horizontal 48.0 μ S max. 48.0 μ S max.

Vertical 15.24 mS max. 17.78 mS max.

Resolution:

Horizontal 690 dots 690 dts

Vertical 240 lines 280 lines

Active Display Area 215(W) x 160(H) mm

Misconvergence Center: within 0.6 mm

Circumference: within 1.1 mm

Display Colors Red, green, blue, yellow, cyan,
(without intensity control) magenta, black, white

Display Characters 80 characters with 25 rows
—8 x 8 dots

Controls:

Inside . . H. width, V. height, H. center, V. center, Focus

Outside Brightness, H. hold, V. hold

Operating Ambient Temperature 0° ~ +40°C

Power supply 220V or 240V AC ($\pm$ 10%) 60 Hz/50 Hz

Power Consumption 67W

Dimensions 378(W) x 307(H) x 413(D) mm

Weight 11.7 kg

NOTE: The above specifications are subject to change
without notice for further improvement.

NEC Corporation

TOKYO, JAPAN

2. In the event of a short circuit or an overload in the +B supply circuit, the protector circuits shut down the output of the +B power supply and the following sequence of events results. The DC output of the full-wave bridge is fed to a voltage divider network, consisting of R607 and R608, and on to the base protector diode D605 fixing the base voltage on the protector transistor (TR602). The emitter of TR602 is tied directly to the 115V DC +B line. The protector transistor is cut off due to the reverse bias. The +B supply circuit functions normally with the protector transistor cut off, but when a short or an overload occurs, the emitter voltage of the

transistor decreases. When the emitter voltage decreases to the conduction point of the transistor the transistor turns on and its collector voltage rapidly decreases and decreases the voltage of the base of the regulator drive transistor (TR601), which makes the transistor cut off. The emitter of the regulator drive transistor is connected directly to the base of the power regulator transistor (TR691). Cutting off TR601 causes the base voltage applied to the series regulator transistor to rapidly decrease, making the series regulator transistor cut off, thereby shutting down the +B supply voltage.

PATHS OF POWER SUPPLY TO HORIZONTAL OSCILLATOR CIRCUIT AT THE TIME OF STARTING (DC 12V)

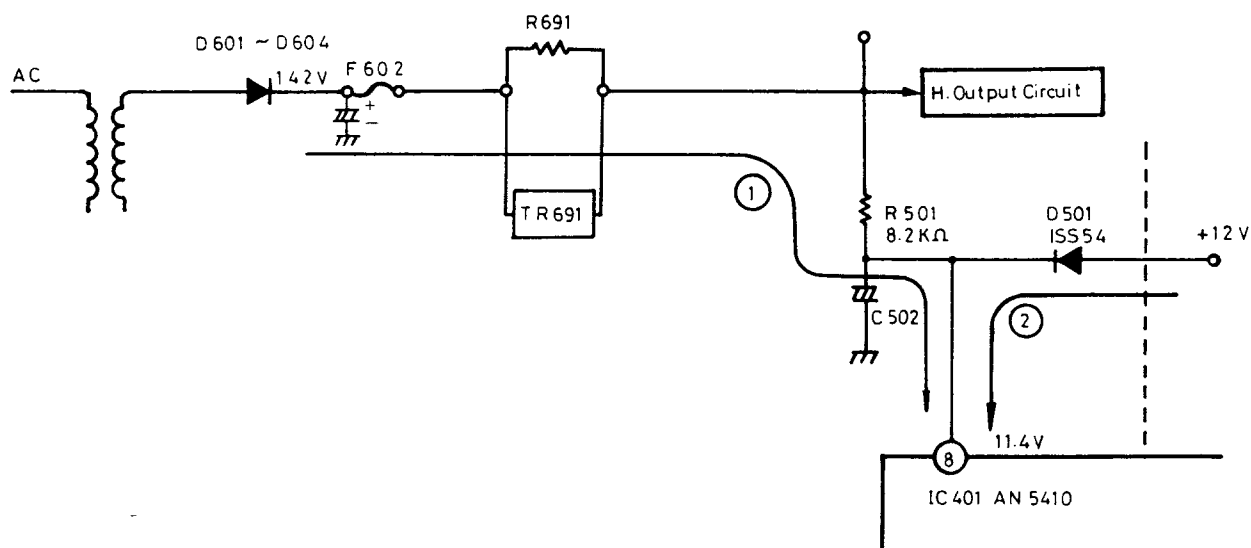


Fig. 9

DC 12V and 25V for driving transistors and ICs come from the secondary side of flyback transformer (FBT). To set the horizontal oscillator circuit in operation, a 12-volt source voltage must be supplied to pin (8) of IC401. How this voltage is obtained will be explained in reference to the circuit diagram. AC voltage (from the secondary side) is first rectified by diodes D601, D602, D603 and D604 (PM2C) and emerges at 115V DC through R691 (300 ohms, 20 watts) and power regulator TR691. This is the voltage (115 volts) available at TP91.

During the short interval following the turning on of the switch and ending with the start of horizontal oscillation, the same voltage is applied to pin (8) of IC401 through path (1) (shown in the diagram) comprising R501 (8.2 kohm), but it is actually 12 volts or thereabout because of the voltage drop (from 115 volts) occurring in R501. It is this 12 volts DC with which the horizontal circuit starts up during the period in question. At the end of this period, the oscillation thus started is sustained and continued with the 12 volts coming to the same pin (8) through path (2) from the secondary side of the FBT.

VIDEO INPUT SECTION (See Fig. 10)

This section amplifies and intensity-controls the R, G, B, output signals of the character generator to a level high enough to drive the video output circuit. How this is accomplished will be explained by considering one of the three circuit for the RED, GREEN, and BLUE video signals. Since these three circuits are identical, let's consider the RED signal.

This input signal is a TTL level signal, positive in polarity. It enters IC792 at pin 5 and comes out, inverted, at pin 6. From pin 6 it is applied to pin 5 of IC793. IC793 is essentially an inverter with open collector. When its output pin 6 is HIGH, the base of TR751 will be at the collector voltage (10V) of this transistor; when pin 6 goes LOW, the base of TR751 will shift to 5V, a divided voltage through R752 and R751. Consequently, an amplified signal of approximately 5Vp-p shows up at the emitter of TR751. This amplified signal is applied to the VIDEO OUTPUT stage. This condition is based on the fact that pin 8 of IC793 is HIGH.

This video input circuit also has a means to control the amplitude of the output amplifiers in order to produce 15 colors at the CRT screen. We will now consider this intensity control circuit.

The intensity signal input is pin 1 of the 8 pin signal input connector, (terminal C2 on PWD-227). This signal is also a

TTL level and enters IC791 and exclusive OR gate at pin 1 and outputs at pin 3 of IC791. From pin 3, it is applied to pin 9 of IC793. Pin 8 (open collector) is the output for the intensity control signal. When intensity control input is HIGH (pin 8 of IC793 is also HIGH), the 5Vp-p video signal described above appears at the emitter of TR751. This is the highest voltage swing available, therefore maximum drive to the CRT and maximum brightness of the screen.

When intensity control input is LOW and the video signal (RED) input is HIGH, the base voltage of TR751 becomes slightly smaller now, being a divided voltage through R752, R751, and R793. The emitter voltage of TR751 will not be approximately 3.6Vp-p (75% of max swing) and the brightness on the CRT screen will be approximately 50% of the maximum brightness level.

When the intensity control signal and video signal (RED) are both LOW no light output is available due to CRT cut off. When the intensity control input signal is "HIGH" and the video input signal is "LOW", pin 6 of IC793 will be LOW, therefore output pin 8 of IC793 will not have any control of the base voltage of TR751. The control of TR751 base will be from IC793 pin 6 at a low, therefore the CRT will be at cut off, and therefore no light output.

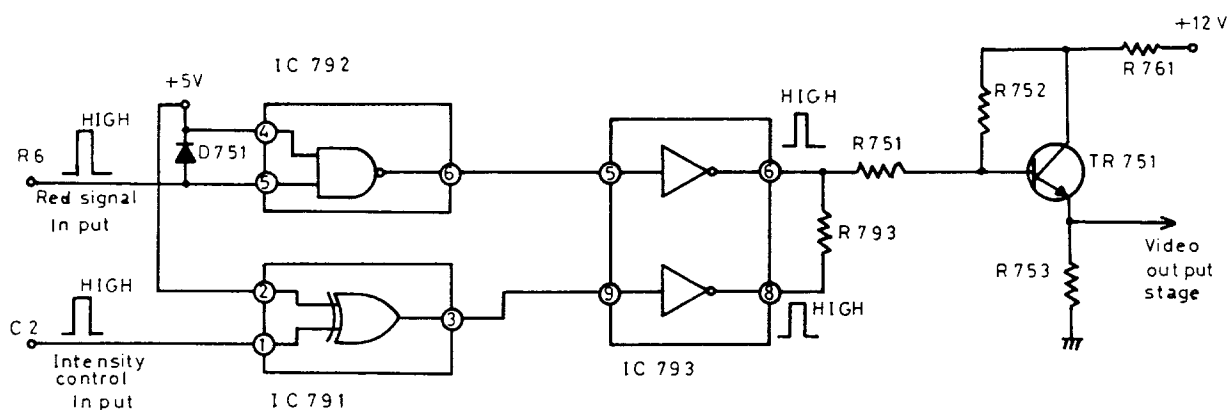
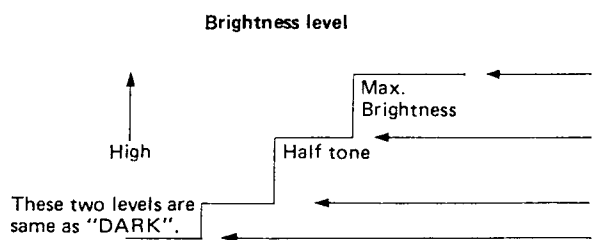


Fig. 10

VIDEO INPUT CIRCUIT & BRIGHTNESS LEVEL



W/Intensity Control		W/O Intensity Control	
Intensity Control	R/G/B Signal	Intensity Control	R/G/B Signal
HIGH	HIGH	OPEN (HIGH)	HIGH
LOW	HIGH	X	X
HIGH	LOW	OPEN (HIGH)	LOW
LOW	LOW	X	X

SYNC. RECEIVER (See Fig. 11)

The sync circuit receives a separate TTL level sync signal (HD) and vertical sync signal (VD), both of either positive or negative, polarity selectable with the sync polarity switch on the back panel of the cabinet.

When HD and VD are both positive sync signals, from the character generator/personal computer etc., the sync polarity selector should be positioned, "POSITIVE". The sync polarity selector switch is now open, and pin 9 and pin 13 of IC791 are HIGH. IC791 is an "EXCLUSIVE OR" gate and output pin 8 and pin 11 will both be negative pulses. These negative pulses are applied to input pin 13 and input pin 12 of IC792. Output pin 11 which will be composite sync pulses are applied through C758 and R778

to pin 24 of IC401 for sync processing. (Refer to sync/osc circuit description).

When VD and HD are both negative sync signals, from the character generator/personal computer. The sync polarity selector switch should be positioned "NEGATIVE" in this case the sync selector switch is "CLOSED" and pin 9 and pin 13 of IC791 are both grounded (LOW) and the output pulse polarity of pin 8 and pin 11 will both be negative. With negative pulses at the input of IC 792 the output will be positive composite sync applied through C758 and R778 to pin 24 of IC401 for sync processing. (Refer to sync/osc circuit description).

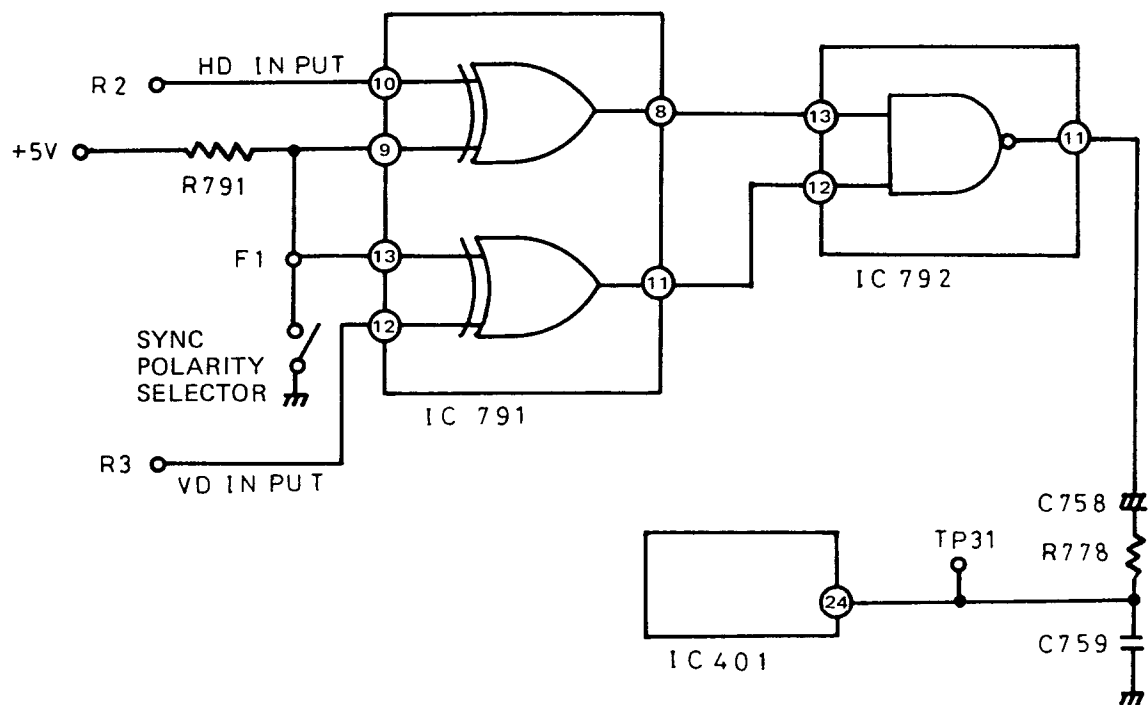
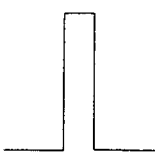
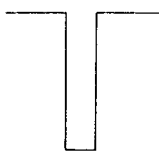
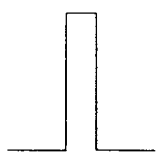
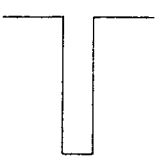


Fig. 11

SYNC. RECEIVER CIRCUIT

Input signal polarity	SYNC. POLARITY SELECTOR SWITCH	#8, #11 pin output of IC791	#11 pin output of IC792
 POSITIVE	OPEN (#9, #13 pin of IC791 HIGH)	 NEGATIVE	 POSITIVE
 NEGATIVE	CLOSED (#9, #13 pin of IC791 LOW)		

VIDEO OUTPUT

The voltage and signals required to operate the CRT are integrated on the VIDEO-CRT PWB (PWC-984). The board contains three bias controls; RED bias (VR904), GREEN bias (VR905) and BLUE bias (VR906), and two drive controls; RED drive (VR902) and BLUE drive (VR903).

The RED, GREEN and BLUE signals are directly coupled from R, B and G amplifiers on the MAIN PWB (PWC-976) and the luminance signal also directly coupled from the output of video output transistor (TR705) on the MAIN PWB (PWC-976).

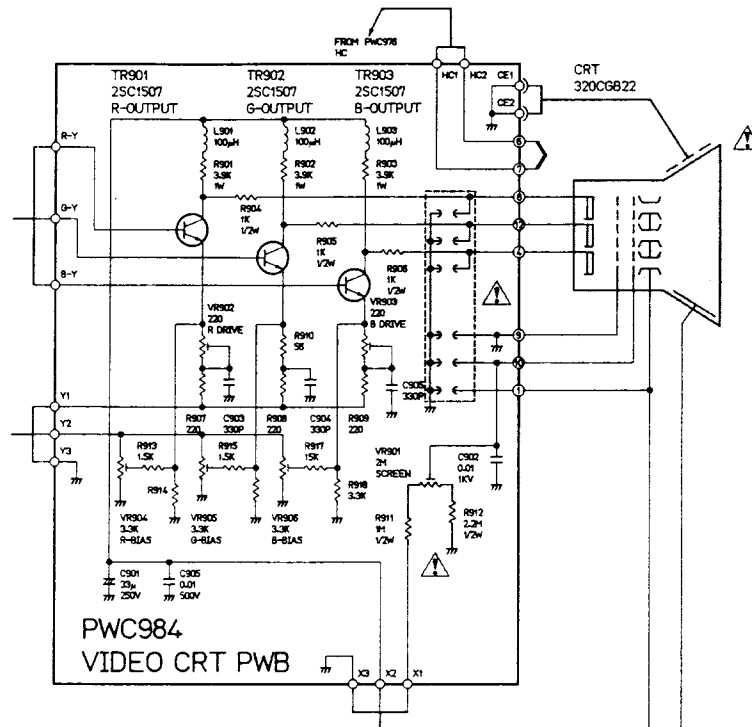


Fig. 12

DESCRIPTION OF IC401 (AN5411)

This IC contains all the circuits for sync separation, oscillations for horizontal and vertical deflections and AFC and HV protection. Its input is a composite sync signal, which is input through R778 and C758 to pin (24).

The input signal is first applied to the sync separation circuit, and the sync signals are separated and taken out for application to the horizontal AFC and vertical trigger pulse. C405, connected to pin (21), is an integrating capacitor for separating vertical sync pulses.

C401, R401 and VR402, connected to pin (19), provide the time constant of the vertical oscillation circuit: the frequency of this oscillation can be varied by adjusting VR402, C402, connected to pin (13), is the capacitor for the generation of sawtooth wave.

The time constant of the horizontal oscillation circuit is determined by C504 and C505, connected to pin (7), and R507, R506, R521 and VR501, connected to pin (6). The frequency of horizontal oscillation can be changed by means of VR501.

The 110 Vp-p pulses occurring in the secondary winding of

FBT and available at pin (5) are input as pulses for sawtooth wave generation through C510 and pin (1) of IC401. These pulses after integration in C506 connected to pin (2), are applied as the comparison signal through C505 and pin (3) to the horizontal AFC circuit.

The voltage resulting from comparison and detection is taken out through pin (5), smoothed by C507, C508 and R508, and fed as the horizontal AFC voltage to the oscillation circuit through R505.

The X-ray protection circuit operates by shutting down the horizontal oscillator in reference to a voltage produced by rectifying the flyback pulse. This scheme, based on the fact that the flyback pulse and high voltage (anode voltage) are proportional works in the following manner: Flyback pulse with positive polarity are rectified by D2001 and C2003, and the resulting DC voltage is applied to pin (12) of IC401. When the high voltage exceeds the limit, the DC voltage will be so high as to shut down the horizontal oscillator. The loss of this oscillation results in the loss of raster, but the 115V DC power supply remains unaffected.

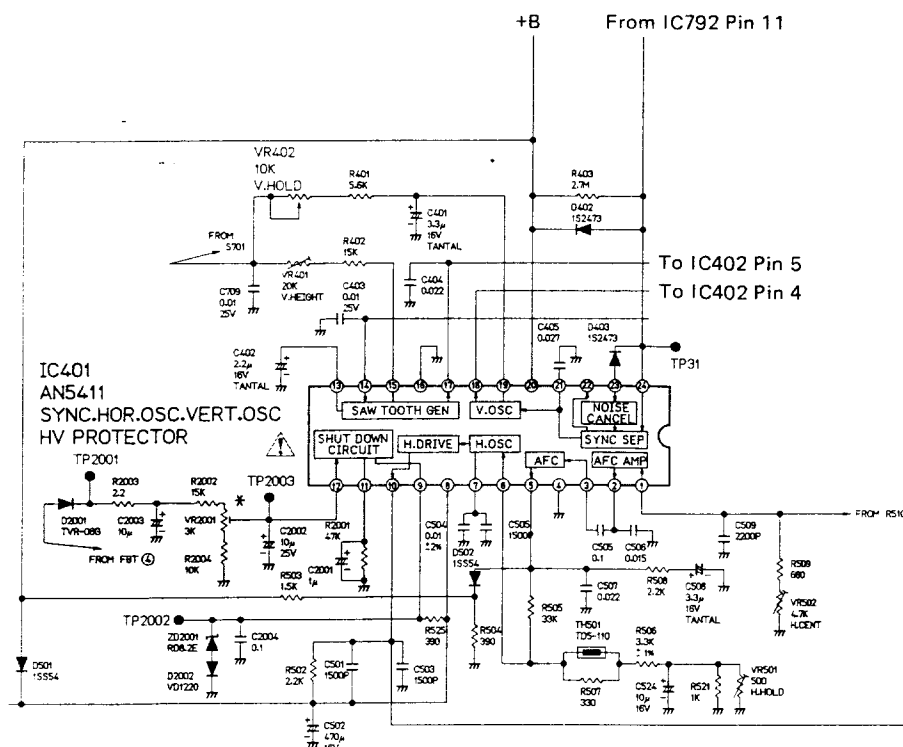


Fig. 13 SYNC, HOR. OSC, VERT. OSC, HV PROTECTOR, H. AFC

DESCRIPTION OF μ PC1358H (AN5510)

The μ PC1358H is an IC chip comprising two circuits: the push-pull OTL vertical output circuit and retrace suppression signal amplifier.

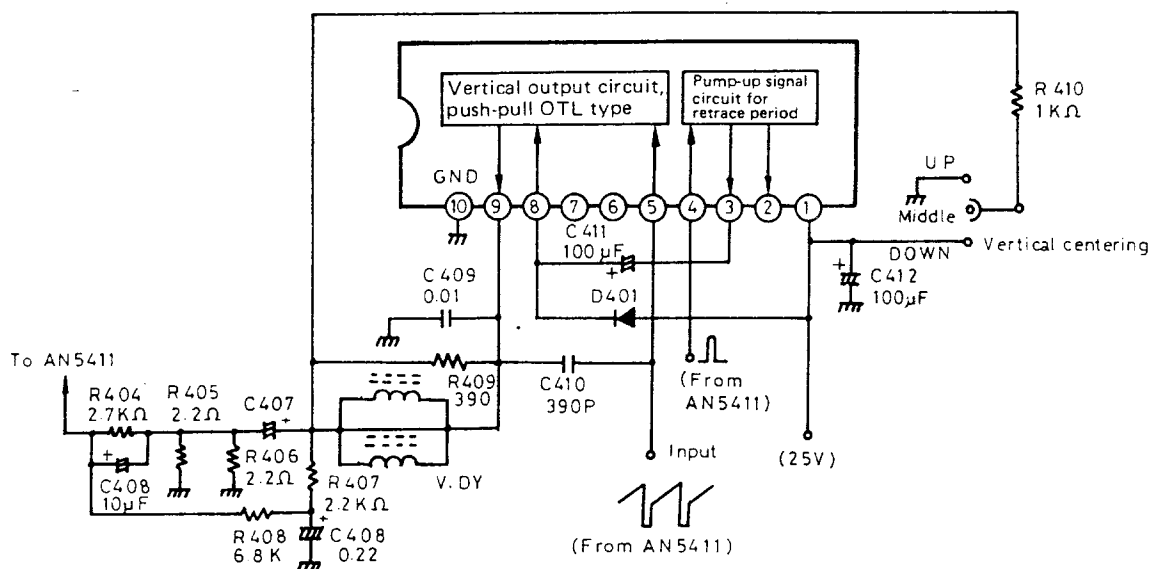


Fig. 14

The 60-Hz signal, originating in AN5411 (not shown in Fig. 12) an amplified, is fed to pin (5) and is then amplified further by the OTL push-pull circuit (vertical output circuit). The amplified 60 Hz signal goes out through pin (9) to the vertical deflection yoke, causing a sawtooth current to flow in the yoke coil.

R410 is the means of adjusting vertical centering: the direction of direct current in the deflection yoke can be changed for centering.

Vertical blanking pulses enter the pump-up circuit (retrace suppression signal amplifier) through pin (4).

Similarly, another pulse signal comes out through pin (3).

This signal is a positive vertical pulse signal, which is fed through C411 and pin (8), the pin connected to the B terminal of the vertical output circuit in order to pump up (raise) the B voltage only during the retrace period: the object of this momentary voltage boosting is to improve the efficiency of amplification. The reason is that the input to the output circuit consists of sawtooth waves on which pulses are superimposed as shown, whereas the high B voltage is needed only during each retrace period. In other words, the signal coming in through pin (9) serves to momentarily raise the B voltage. D401, inserted in the path of this signal to prevent it from flowing backward.

POWER SUPPLY FROM SECONDARY WINDING OF FBT (12V and 25V)

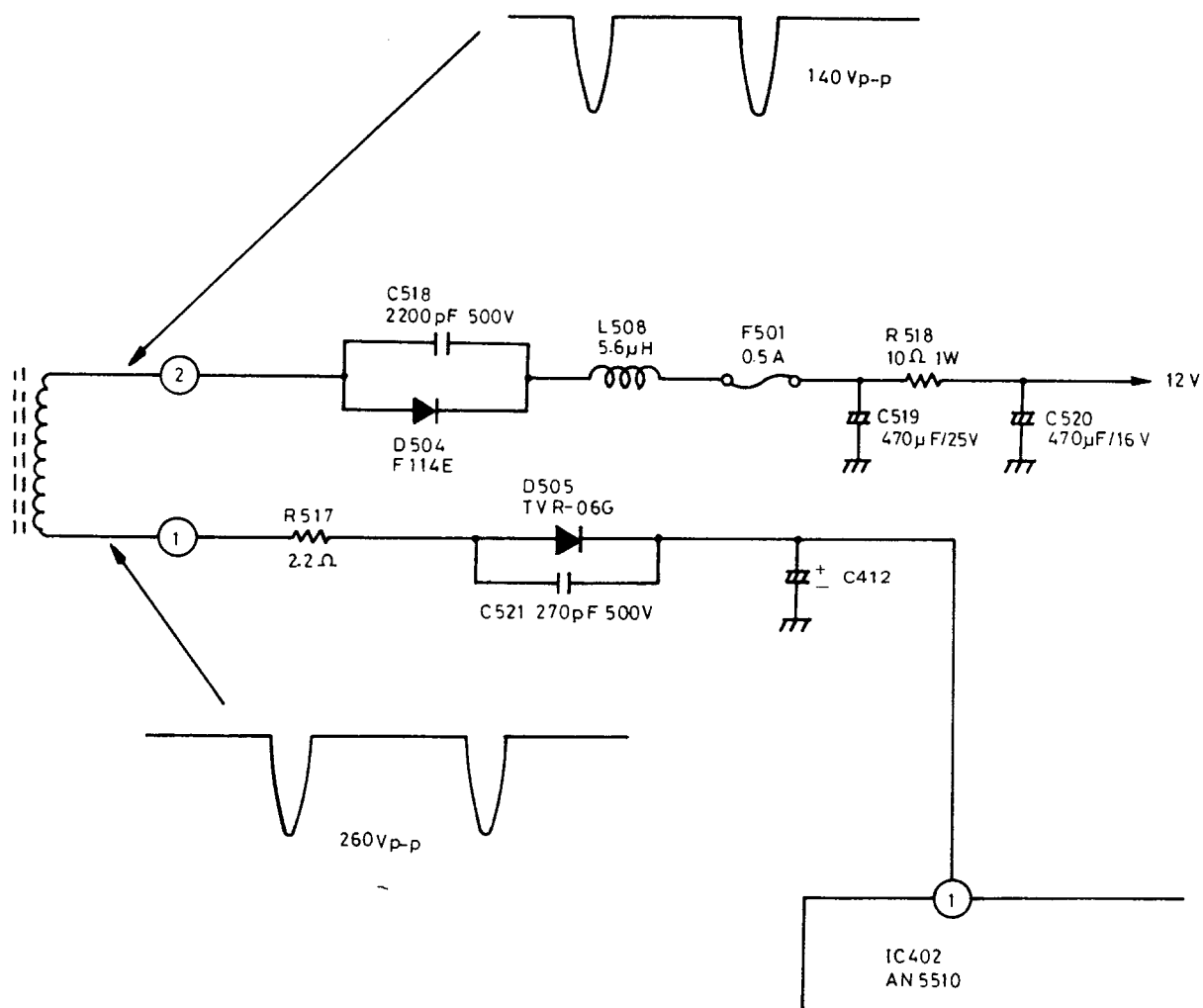


Fig. 15

The 140 Vp-p pulses appearing from secondary terminal (2) of the flyback transformer are converted to DC 12 volts through rectification by D504 and filtering by C519, 520 and R518. This DC 12 volts is supplied to transistors

and ICs. Similarly, 260 Vp-p pulses emerging from terminal (1) are rectified by D505 and filtered to the DC 25 volts applied to pin (1) of IC402.

HORIZONTAL DRIVE CIRCUIT

This circuit is located between the oscillator circuit and output circuit, and serves to amplify the output of the oscillator and thereby drive the output transistor.

The nearly square pulse output of the oscillator is applied to the base of TR501 to turn on and off this transistor,

thereby passing pulse current through the primary side of transformer, Fig. 15.

Each time the transistor turns on or turns off spiking occurs because of inductance. C512 and R512 are the circuit that absorbs the spikes to protect the transistor.

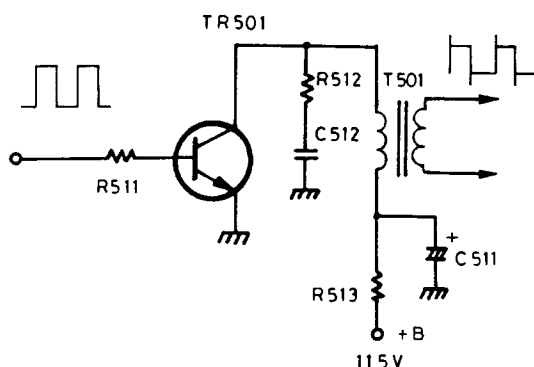


Fig. 16 Horizontal Drive Circuit

HORIZONTAL OUTPUT CIRCUIT

It will be recalled that, for vertical deflection, the output circuit amplifies sawtooth current to drive the coil: the sawtooth waveform is prepared in advance. This is not the

case in horizontal deflection: as horizontal deflection is based on a different system.

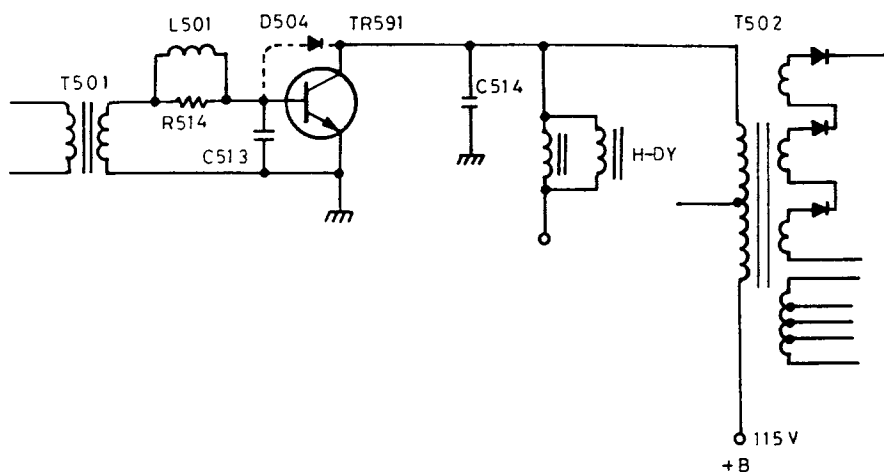


Fig. 17 Horizontal Output Circuit

The sawtooth wave is produced in the deflection coil as the sum effect of 1) the switching action of transistor TR591, 2) the damping action of diode D504, 3) the very large time constant of the L and R of the coil itself, and 4) an equally large time constant offered by D504 and L of the coil. Before discussing of the theory underlying this effect, remember that the horizontal deflection coil has to swing the beam 15,750 times a second, whereas the vertical coil has to deflect it 60 times a second. TR591 sees two parallel loads: the deflection coil H-DY and the horizontal output transformer.

NOTE:

The damper diode D504 is not provided in the circuit; the junction of the collector base of TR591 takes its place. Fig. 19 shows a basic output circuit (a) and its equivalent (b) in order to facilitate analysis of the action of producing the sawtooth current.

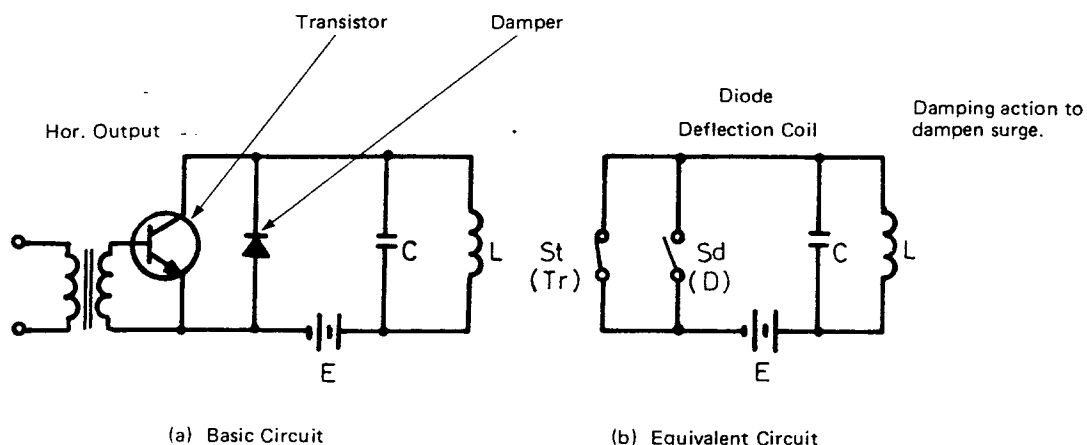


Fig. 18 Basic Horizontal Output Circuit and its Equivalent

1. Consider the duration from t_1 to t_2 in Fig. 19 and refer to the equivalent circuit (b) in Fig. 18, above. Pulse voltage is applied to the base of transistor: When this voltage is on, the transistor conducts is saturated. This condition is equivalent to when switch "St" is

closed, Fig. 19. Consequently, current flows through the coil from source E and, because of the large time constant (L/r_L), r_L being the resistance of the coil (DY), the current increases gradually until the transistor switches off at t_2 .

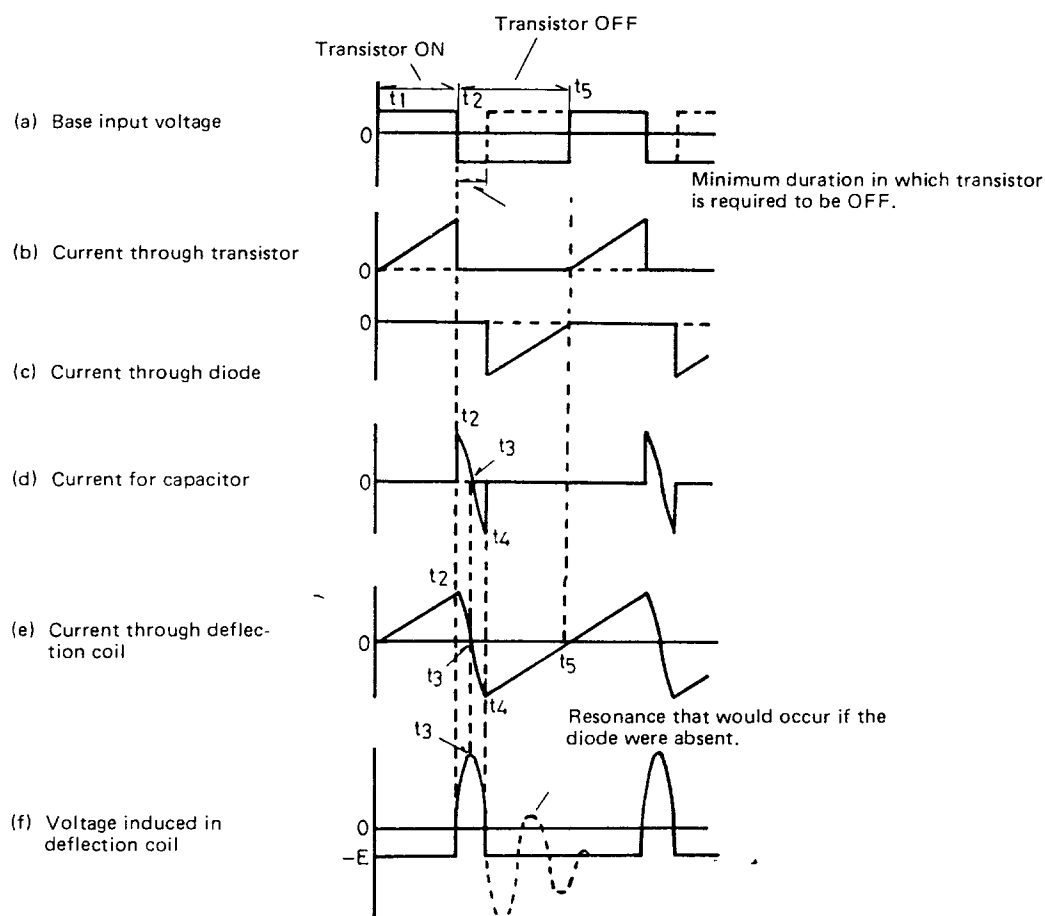
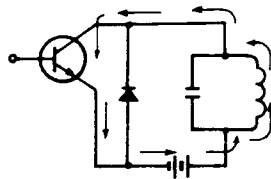
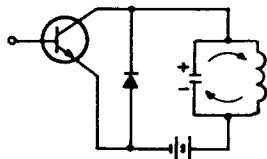


Fig. 19 Waveforms Involved in the Operation of Horizontal Output Circuit

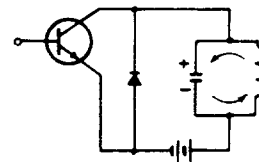
It should be pointed out here that the values of the C (capacitor) L (coil) that they are a resonant circuit, in which an amount of energy cyclically shifts between elements C element and L.



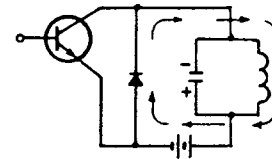
(a) Second half of scanning period
($t_1 - t_2$)



(c) Second half of retrace
($t_3 - t_4$)
(Capacitor is discharged)



(b) First half of retrace
($t_2 - t_3$)
(Capacitor is charged)



(d) First half of scanning period
($t_4 - t_5$)

Fig. 20 Directions of Current Flow through Coil

When the transistor is off, self-induced current flows into the capacitor and, at moment t_3 , charges it (see waveform (d), Fig. 19) as a result, the voltage across C becomes maximum. This voltage peaking is referred to as the "flyback pulse".

3. From t_3 to t_4 :

At moment t_3 , the capacitor starts discharging, and discharging current flows in the reverse direction through the coil. (See diagram (c) of Fig. 20, and waveform (d) of Fig. 19). The reverse current increases as the capacitor voltage falls; when the voltage reaches zero at t_4 , this current is maximum and begins to charge the capacitor in the reverse direction. In other words, the reverse voltage of the capacitor begins to rise at t_4 .

4. From t_4 to t_5 :

Slightly after t_4 , the rising reverse voltage exceeds the emf of source E, and the reverse current flows not into C but through diode D: the capacitor ceases to be charged (in the reverse direction). Because of the damping action, this current dies down gradually. D forms a short-circuit for the LC resonance circuit. The slow current decrease is due to the large time constant due to L/r_D , r_D being the internal resistance of the diode.

2. From t_2 to t_3 , the base voltage is off and the transistor remains switched off: this is equivalent to switch "St" being open.

At moment t_2 , current is interrupted sharply but a current due to the counter-emf of the coil occurs as if the transistor were still conducting. (Refer to two diagrams (a) for $t_1 - t_2$ and (b) for $t_2 - t_3$ of Fig. 20.)

At t_5 , the current is zero and the transistor is switched on and starts to conduct again, thus resuming the next cycle of producing the next sawtooth wave, as shown by waveform (e). Note that the current decreases linearly in $t_1 - t_2$ and also in $t_4 - t_5$ because of very large values of L/r_L and L/r_D , and that the sum of the two currents flowing through the deflection coil has the shape of a sawtooth.

The power that the output transistor handles is very large and consequently it generates a large amount of heat. For this reason, it is attached to a heat sink. It has to be capable of switching off sharply and also of withstanding the stress due to the flyback pulses, each occurring during every retrace period, and has to have excellent frequency characteristics.

Specifically, the pulse voltage occurring during each retrace period peaks to a level nearly 8 times the +B voltage, which is in this case 115 volts. Thus the output transistor must be capable of withstanding at least 1,000 volts.

The damper diode, too, must be capable of withstanding the same voltage peak. Its frequency characteristic must be just as good as that of the transistor, and it must be capable of passing large current with a small internal resistance.

ADJUSTMENT OF SEMI-FIXED CONTROLS

1. +B Voltage Adjustment: VR601 115V Adjustment

Connect the DC voltmeter (with a range of 150V) between TP91 on the MAIN PW board and the Ground, and adjust VR601 so that the voltage is 115V.

2. Horizontal Hold Adjustment: VR501

Connect TP31 on the printed wiring board to the Ground and cut the synchronizing signal. Next, turn VR501 (H. Hold) and adjust it until the synchronization comes in the center. Remove the connection between TP31 and the Ground, turn the power switch on and off, and thus confirm the stability of synchronization.

3. Vertical Hold Adjustment: VR402

Turn VR402 (V. Hold) and adjust it until synchronization is secured.

4. Vertical Height Adjustment: VR401

Display a character signal (for instance the character H) to fill the screen of the CRT, and adjust VR401 until the best vertical height is obtained.

5. Horizontal Positioning Control: VR502

This is to control on the left-right movement of the center of the picture. Adjust it until the center of the picture comes to the center of the screen.

6. Horizontal Width: L507

Adjust core of Horizontal Width Coil L507 to obtain proper width of horizontal scanning.

The adjustment described in 7, 8, 9 and 10 below should be done when focus or white balance is extremely bad due to replacement of the picture tube or aging causing the characteristics of the picture tube to deteriorate.

7. Focus Adjustment: VR591

Turn VR591 and adjust it until the best focus is obtained.

8. White Balance Adjustment

NOTE:

Prior to white balance adjustment, be sure to check the condition of #1 pin of 8-pin signal input connector (ie. Intensity control input terminal). #1 pin of above Input connector should be;

OPEN in case of connecting PC-8001 or another non-intensity controlled signal generator.

"HIGH" Level . . . in case of connecting the IBM Personal Computer or another intensity controlled signal generator.

VR901 (screen), VR904 (red bias), VR905 (green bias), VR906 (blue bias) VR902 (red drive), VR903 (blue drive), SW701 (service switch).

- (1) Receive input signal of white Raster Pattern.
- (2) Turn VR901 fully counterclockwise and set VR904, VR905, VR906, VR902 and VR903 to their mechanical centers.
- (3) Set SW701 to the SERVICE side and turn VR901 gradually clockwise so as to obtain horizontal line.
- (4) Turn the color bias VR. which light for the first time, out of the three colors; red, green and blue counterclockwise and eliminate the horizontal line of that color.
- (5) Turn VR901 slightly clockwise so that the horizontal line of the color which appears last lights slightly.
- (6) Then turn VR901 clockwise gradually and rotate the bias VR of the color which appears second, so to eliminate the horizontal line of that color.
- (7) Adjust to obtain horizontal lines of the same brightness for red, green and blue by turning the bias VRs of the colors, which emitted light first and second.
- (8) Then position SW701 at NORMAL and adjust to get white with VR902 and VR903.
- (9) Lastly confirm that white color is obtained in both bright and dark by turning the brightness control.

9. Purity

NOTE:

Allow 10 minutes of warm-up before attempting the following adjustment procedure.

- (1) Degauss picture tube.
- (2) Receive a white raster pattern.
- (3) Position the Magnet Assembly, and tabs of magnets as shown below. (Fig. 21, Fig. 22)
- (4) Disconnect the "G" connector on the MAIN PWB, and adjust the Brightness Control for a bright picture.
- (5) Loosen the Deflection Yoke Clamp and slide the Deflection Yoke backward against the Magnet Assembly.
- (6) Adjust the Purity Magnet (front pair) by moving their tabs the same distance in opposite directions. Adjust them so that the magnet color mass is at the center of the screen.
- (7) Move the Deflection Yoke forward and position it where the best purity is obtained. Tighten the yoke clamp. Place a "Temporary" wedge between the upper side of the Deflection Yoke and the CRT, if necessary, to keep the yoke straight. Position the wedge so that no purity shift occurs.
- (8) Reconnect the "G" connector. If necessary, adjust the Red (VR751), Blue (VR753) and Green Bias (VR752) control on the main PWB for proper color temperature.
- (9) Set the Service Switch (SW401) to the "Service" position, and rotate the yoke, if necessary, to "level" the horizontal line.

With the Vertical Centering Control (VR405) on the MAIN PWB on the center position, confirm that the horizontal line is within +5 mm from the geometrical

center of the CRT (CRT marks on edge). If not, rotate both purity magnets together until it is centered. Be careful not to change the relationship between the two magnets.

- (10) Set the Service Switch (SW401) to the "Normal" position, and confirm purity.
- (11) Tighten yoke clamp.

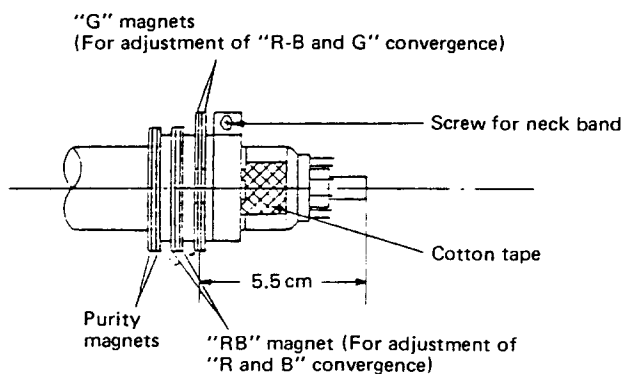


Fig. 21

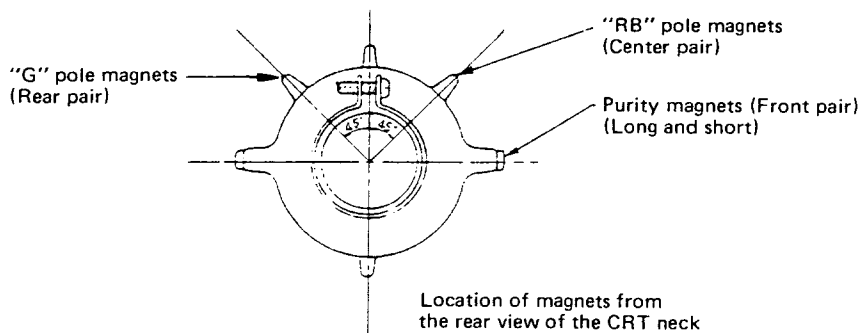


Fig. 22

10. Convergence Adjustment

NOTE:

Allow 10 minutes of warm-up before attempting the following adjustment procedure.

- (1) Receive a cross hatch pattern.
- (2) Adjust focus at maximum brightness.
- (3) Disconnect the "G" connector on the MAIN PWB.

- (4) Adjust the "R-B" Magnet (center pair) to converge the red and blue lines at the center of the screen, as shown in Fig. 23.
- (5) Reconnect the "G" connector. Adjust the "G" Magnets (rear pair) to converge the magenta and green lines at the center of the screen, as shown in Fig. 23.

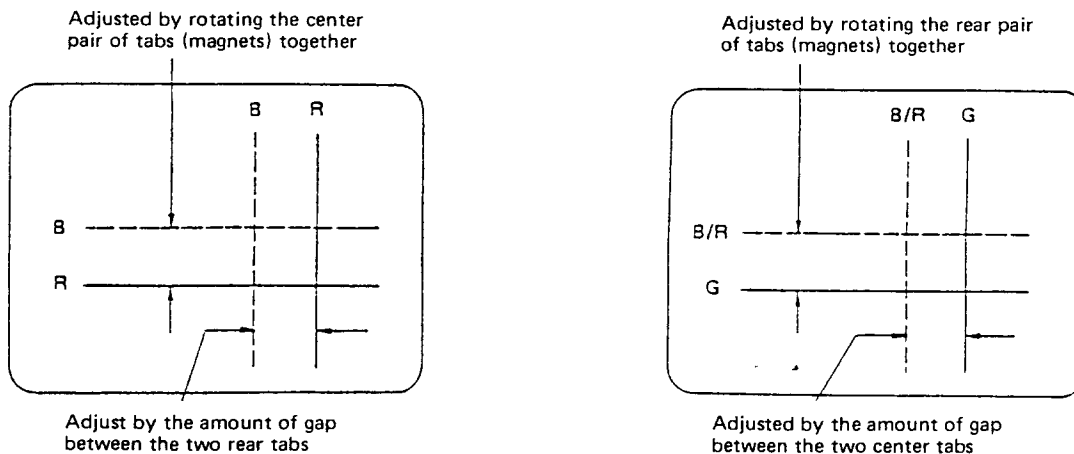
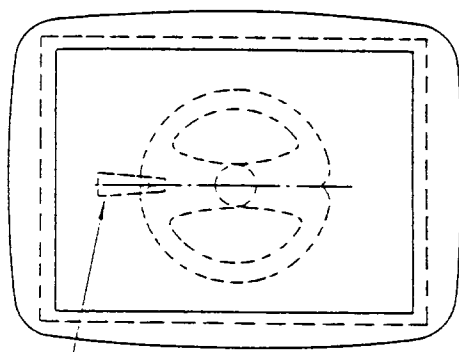
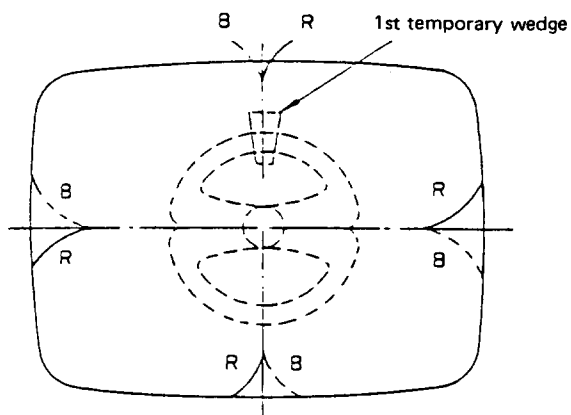


Fig. 23

- (6) Readjust purity, if necessary.
- (7) Refer to Fig. 24 and converge areas shown by filtering the Deflection Yoke UP or DOWN. Insert a "temporary" wedge to hold in position.
- (8) Refer to the Fig. 24 below, and insert a second "Temporary" wedge between the right or left side of the Deflection Yoke and the CRT.
- Tilt the Deflection Yoke for best convergence of areas shown.
- (9) Put the ferrite sheet (rubber) on CRT funnel to obtain the best convergence on circumference, if necessary.



Insertion of 2nd temporary wedge

If B is on the outside and R is on the inside, insert second "Temporary" Wedge from the right side.

If R is on the outside and B is on the inside insert second "Temporary" Wedge from the left side.

Fig. 24

- (10) Insert the first "permanent" wedge between the bottom of the Deflection Yoke and the CRT, the second wedge at the 2 o'clock position, and the third wedge at the 10 o'clock position as shown in Fig. 25.

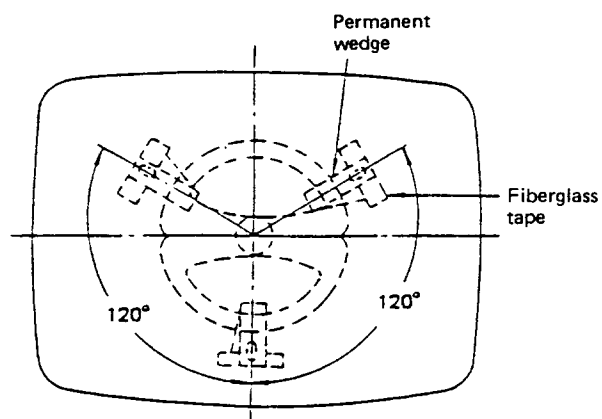


Fig. 25

- (11) Apply a suitable adhesive (GE RTV162 or equivalent) between the permanent wedge and CRT Funnel as shown in the Fig. 26 below.
- (12) Remove the "Temporary" wedges. With special attention to maintain the exact yoke position, push the three permanent wedges into stabilize the yoke.
- (13) Apply a fiberglass tape (Scotch 69 or equivalent) to the wedges and CRT funnel as shown in the Fig. 25.

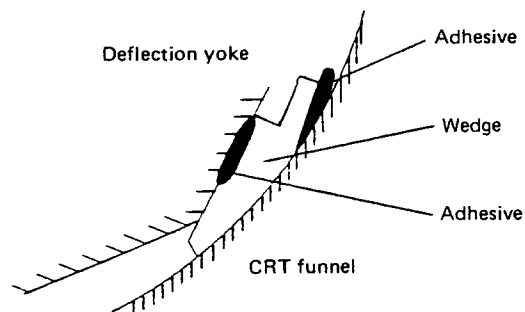


Fig. 26

- (14) Apply an adhesive to the Magnet Assembly to prevent any slippage of the magnet.
- (15) Leave the unit until the adhesive becomes dry.

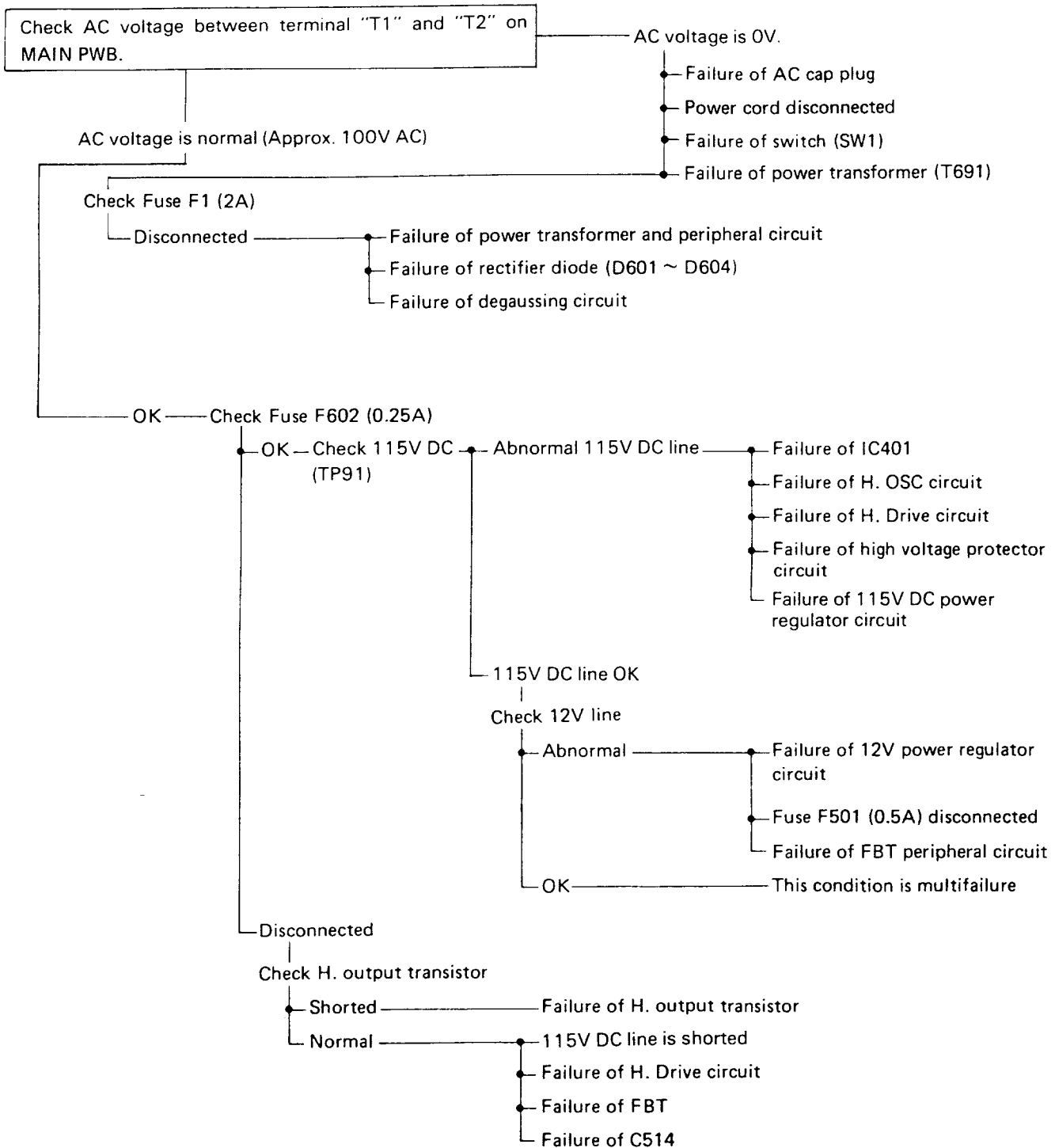
11. High Voltage Protector Adjustment

Do not attempt to adjust VR2001.

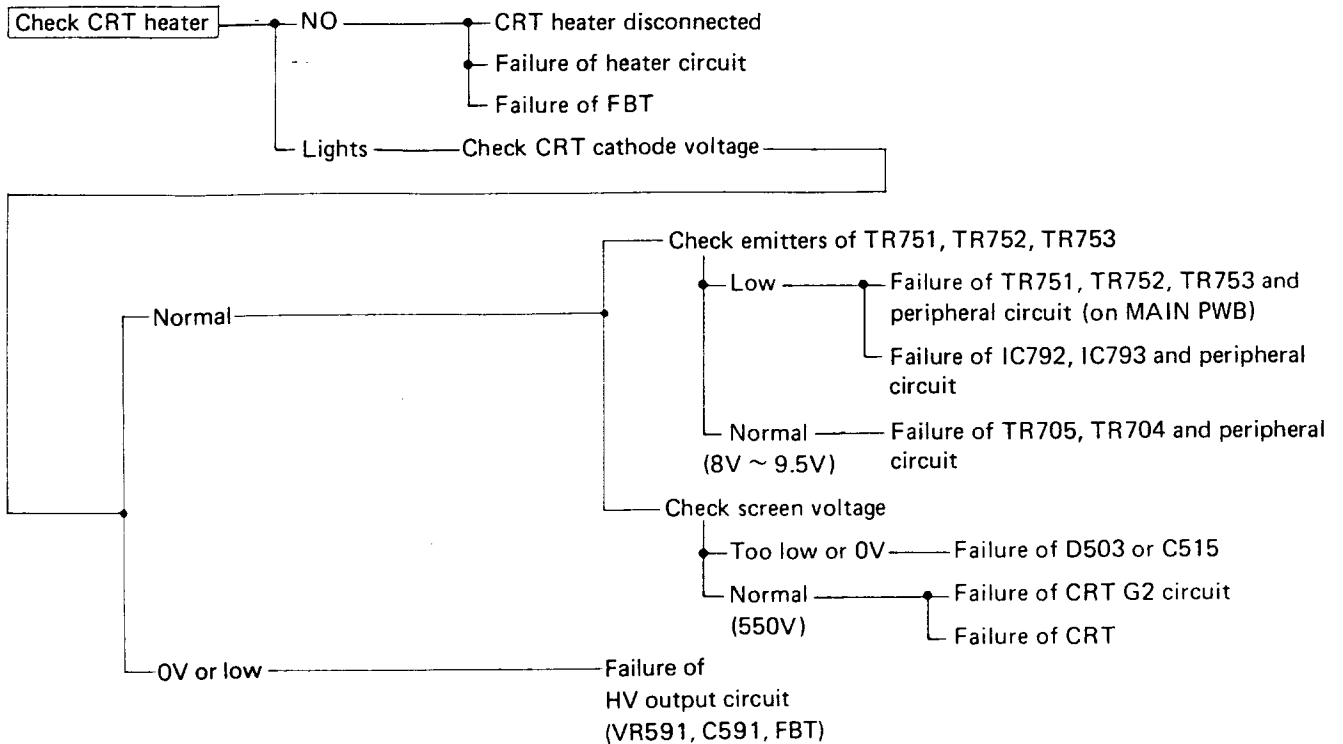
This circuit is adjusted and sealed at the factory. The adjustment in the field is prohibited by requirements of DHHS.

TROUBLESHOOTING

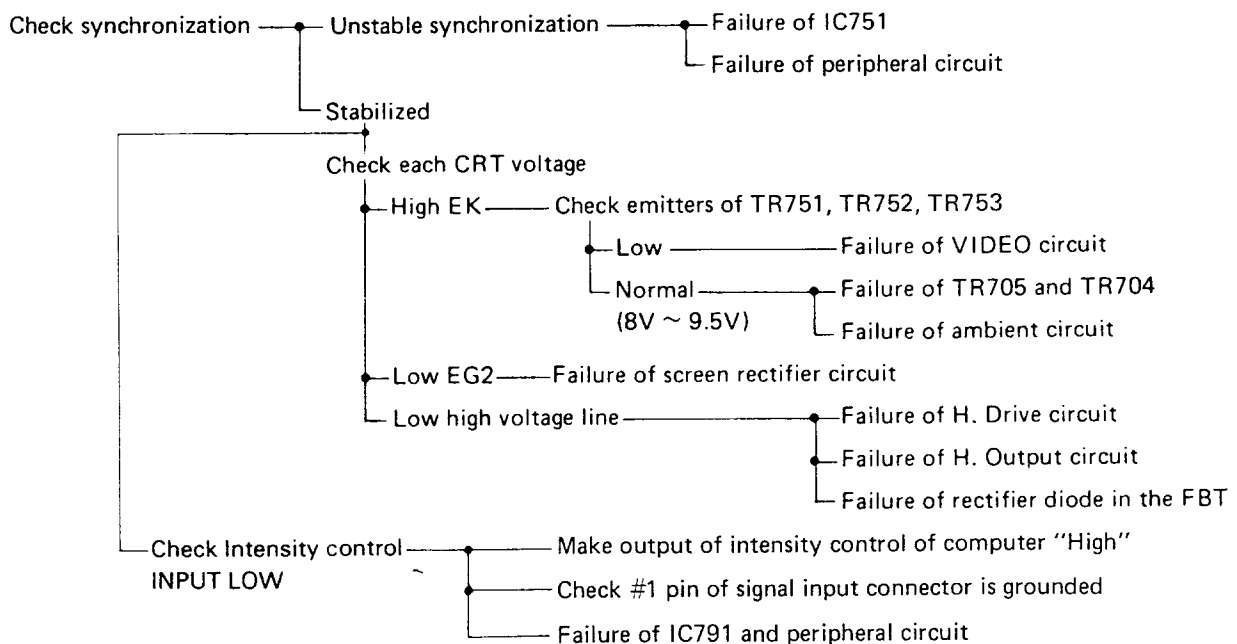
1. No Raster



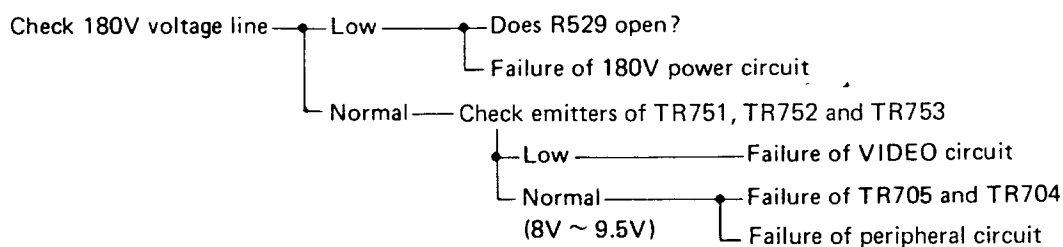
2. No Raster



3. Dark Raster



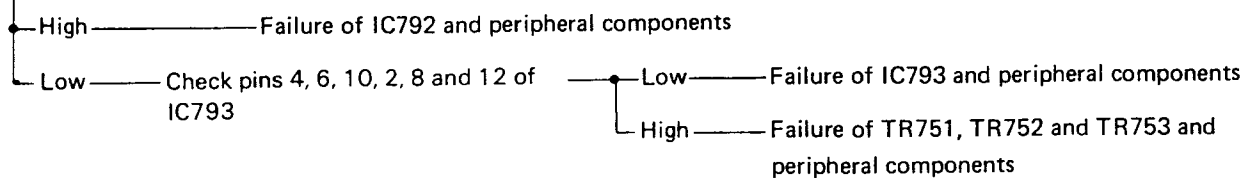
4. Abnormal Brightness of Screen



5. Normal Raster, Picture Abnormal

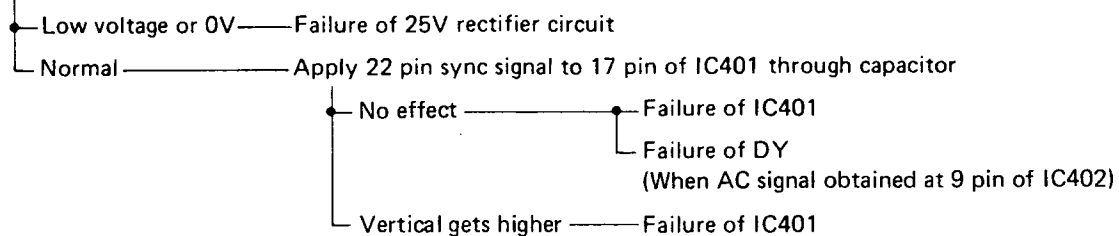
NOTE: Apply positive (high) signals as input for R, G, B and Intensity.

Check pins 3, 6 and 8 of IC792



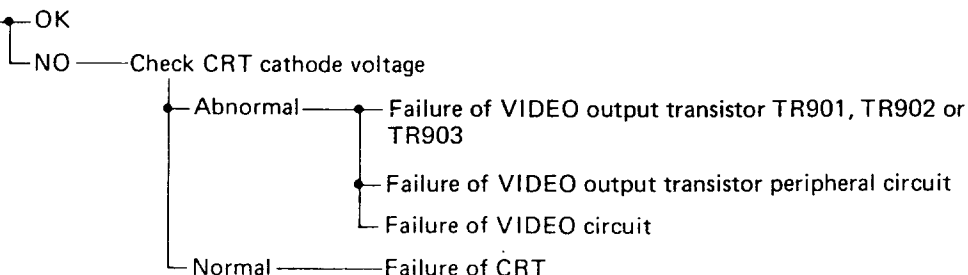
6. No Vertical Sweep

Check +B 25V voltage on rectifier circuit (#1 pin of IC402)



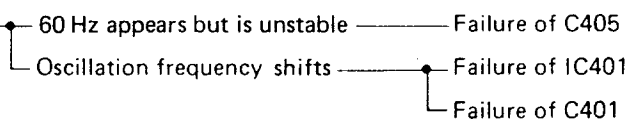
7. Failure of White Balance

Readjust white balance



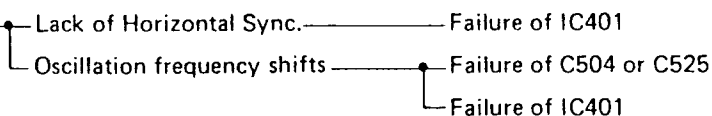
8. Unstable Vertically

Check frequency variation rotating V-Hold



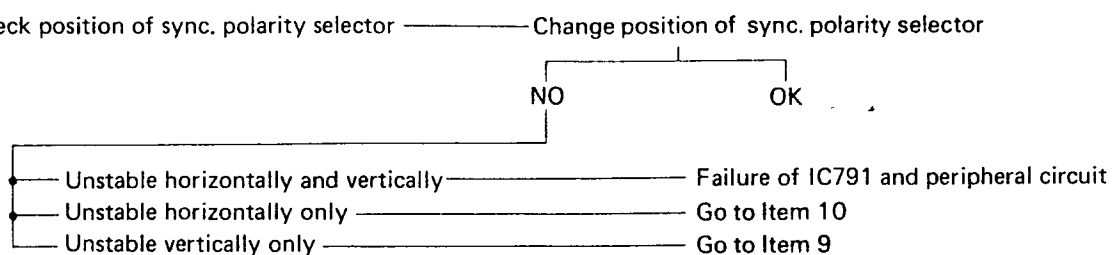
9. Unstable Horizontally

Check frequency variation by rotating H-Hold



10. Unstable Horizontally & Vertically

Check position of sync. polarity selector



REPLACEMENT PARTS LIST

Note: The components identified by  mark are critical for safety. Replace only with Parts Number Specified.

SYMBOL	PARTS NO	DESCRIPTION	QTY
--------	----------	-------------	-----

C R T & T U N E R

Δ	33012017	CRT-320GB22(S) (DISPLAY)	1
---	----------	--------------------------	---

*** ICS ***

IC402	37006006	IC AN5510	1
IC401	37009012	IC AN5411 (HOR)	1
△IC791	37051450	IC HD74LS86P (EX-OR)	1
IC792	37051451	IC HD74LSQOP (NAND)	1
IC793	37051452	IC HD7406P (INVERTER)	1

*** TRANSISTOR ***

TR703	35003517	TR-2SA733/733A 0	1
TR705	35004312	TR-2SA953 L	1
TR691	350046917	TR-2SC1106 Q	1
TR704	35047216	TR-2SC945 P	1
TR701	35047217	TR-2SC945Q	2
TR601	35050512	TR-2SC1507 L	4
TR903			
TR591	35052000	TR-2SC1875	1
TR603	35053012	TR-2SC1941 L	1
TR602	35053213	TR-2SC2002 M	1
TR501	35053812	TR-2SC2371 (8) L	1
TR751	35056112	TR-2SC1675 L	3
TR752	TR753		

*** DIODES ***

D402	D403	D701	360K1000	DIODE,SI.1S2473	4
D702					
D502	D703	D704	360K1015	DIODE,SI.1S554	14
D751	D752	D753			
D754	D755	D756			
D757	D758	D759			
D760	D761				
D501			36001010	DIODE,SI.1S-2472	1
ZD2001AZD601			36003034	DIODE,ZENER RD8.2F	2
ZD751			36003100	DIODE RD5.1ER-2	1
ΔD2001	D505	D506	361K7160	RECTIFIER,SI.1TVR-06G	3
D401			36107075	RECTIFIER,SI.F14A-P	1
D606			36107076	RECTIFIER,SI.F14C-P	1
D601	D602	D603	36107079	RECTIFIER,SI RM-2C	4
D604					
D605			36107085	RECTIFIER,SI.1SR-35-100	1
D504			36107263	RECTIFIER,SI.F114E	1

SYMBOL	PARTS NO	DESCRIPTION	QTY
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DIODES

D503	36107281	RECTIFIER,SI SM-05-16FR	1
ΔD607	38005010	VARIATER,VD1122	1
D2002	38005011	VARIATER,VD1220	1
TH501	3*102015	THERMISTOR,TD5-110	1
ΔTH601	38112015	THERMISTOR,POSITIVE	1

*** TRANSFORMS ***

△	45099036	TRANS POWER	1
T501	45803004	TRANS,H DRIVE	1
△T502	47105098	F.B.T	1
△T401	47502029	TRANS.PIN CUSHION	1

*** VALIABLE RESISTOR ***

Part Number	Part Name	Value	Unit
ΔC591	39510002	39510002	1
VR591	39604901	39604901	1
VR1	41053004	41053004	1
ΔVR901	41056107	41056107	1
VR501	41057553	41057553	1
VR402	41057554	41057554	1
ΔVR2001	41067027	41067027	1
ΔVR601	41067104	41067104	1
VR902	41067202	41067202	2
VR904	41067207	41067207	3
VR401	41067210	41067210	1
VR502	41067358	41067358	1

SWITCHES

SW701	65105101	SWITCH-SLIDE	1
Δ S1	65351007	SWITCH PUSH	1

*** COILS & FILTERS ***

ΔL507		60903011	WIDTH COIL	1
ΔL506		60917022	COIL,H-LIN	1
L501	L508	610G6014	COIL,FILTER 5.6UH	2
L503		610G5004	COIL,FILTER 5.6UH	1
L504		610U5008	COIL,FILTER 120UH 37MHZ	1
L502		61011016	COIL,CHOKE	1
L901	L902	61013025	COIL,FILTER 100UH	3
L505		61064006	COIL FILTER 50UH	1
L491		61067019	COIL,FILTER 150UH	1

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** COILS & FILTERS ***			
	61301096	COIL-DEGAUSSING	1
*** PWB ASSY ***			
	94T25F01	MAIN PWB ASSY	1
	94Y03G01	VIDEO CRT PWB ASSY	1
	94Y06A01	PS PWB ASSY	1
	94Y96S02	SYNC PWB ASSY	1
*** MISCELLANEOUS PARTS ***			
Δ	48007077	DEFLECTION YOKE	1
ΔF602	49005007	MAGNET CPC	1
ΔF501	66652059	FUSE 0.25A,U	2
ΔF1	66671001	FUSE 0.5A	2
	66671005	FUSECAT 250V SEMKO 20MM	2
SG901	66705001	SPARK GAP 1.2KV	3
PL1	67108001	NEON LAMP	1
	70032021	SG/CRT, SOCKET	1
	70051003	SOCKET CN-1208DJFS	1
	70101015	SOCKET, TR	1
	70102009	SOCKET, IC 24PIN	1
	70102104	SOCKET, IC 10PIN	1
	70102212	IC SOCKET 14P	2
	70800011	LINE CORD	1
Δ	71110173	TERMINAL BOARD (W/SW)	1
SW591	71205036	HOLDER, FUSE	2
	71205037	FUSE HOLDER	2
*** APPEARANCE PARTS ***			
	25300611	CABINET BACK	1
	25301951	CABINET FRONT	1
*** KNOB & PUSH BUTTONS ***			
	24461091	KNOB, CONTROL	2
*** PACKING MATERIALS ***			
	24806961	BAG, POLYETHYLENE	1
	24807631	BAG, POLYETHYLENE	1
	24815552	FILLER-L, CARTON	1

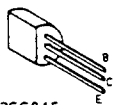
SYMBOL	PARTS NO	DESCRIPTION	QTY
*** PACKING MATERIALS ***			
	24815562	FILLER-R, CARTON	1
	25803772	CARTON BOX	1
	78110801	INSTRUCTION BOOK	1
	78160621	LABEL SCHEMATIC DIAGRAM	1
*** RESISTOR ***			
R514	400K3512	R, SOLID 8.2H 10% 1/2W	1
R411	400K3527	R, SOLID 150H 10% 1/2W	1
R603	400K3529	R, SOLID 220H 10% 1/2W	1
R409	400K3532	R, SOLID 390H 10% 1/2W	1
R410	400K3537	R, SOLID 1.0K 10% 1/2W	2
R512	400K3545	R, SOLID 4.7K 10% 1/2W	1
R510	400K3549	R, SOLID 10K 10% 1/2W	1
R608	400K3552	R, SOLID 18K 10% 1/2W	1
R611	400K3556	R, SOLID 39K 10% 1/2W	2
R516	400K3561	R, SOLID 100K 10% 1/2W	3
R520	400U3031	R, SOLID 330H 10% 1/2W	1
R904	400U3037	R, SOLID 1.0K 10% 1/2W	3
R607	400U3053	R, SOLID 22K 10% 1/2W	1
ΔR911	40023245	R, SOLID 1.0M 5% 1/2W	1
ΔR912	40023253	R, SOLID 2.2M 5% 1/2W	1
ΔR912	40099003	R, SOLID 820K 10% 1/2W	1
R405	401C6609	R, CARBON 2.2H 5% 1/4W	4
R610	401C6643	R, CARBON 56H 5% 1/4W	1
R710	401C6649	R, CARBON 100H 5% 1/4W	1
R507	401C6661	R, CARBON 330H 5% 1/4W	1
R504	401C6663	R, CARBON 390H 5% 1/4W	9
R752	401C6667	R, CARBON 560H 5% 1/4W	1
R757	401C6669	R, CARBON 680H 5% 1/4W	1
R713	401C6673	R, CARBON 1.0K 5% 1/4W	3
R509	401C6677	R, CARBON 1.5K 5% 1/4W	4
R521	401C6679	R, CARBON 1.8K 5% 1/4W	1
ΔR503	401C6681	R, CARBON 2.2K 5% 1/4W	3
R708	401C6683	R, CARBON 2.7K 5% 1/4W	2
R707	401C6691	R, CARBON 5.6K 5% 1/4W	1
R407	401C6693	R, CARBON 6.8K 5% 1/4W	2
R404	401C6697	R, CARBON 10K 5% 1/4W	2
R401	401C6699	R, CARBON 12K 5% 1/4W	1
R408	401C6701	R, CARBON 15K 5% 1/4W	1
ΔR2004	401C6697	R, CARBON 10K 5% 1/4W	2
R702	401C6699	R, CARBON 12K 5% 1/4W	1
ΔR2002	401C6701	R, CARBON 15K 5% 1/4W	1

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** RESISTOR ***			
R402	R704	401C6703	2
R505		401C6709	1
ΔR2001	R712	401C6713	2
R714	R715	401C6721	2
R616		401C6729	1
R606		401C6733	1
R716		401C6741	1
R910		401U2143	1
R907	R909	401G2157	3
R913	R915	401G2177	3
R914	R916	401G2185	3
R754	R755	401G6163	2
R792	R793	401G6182	3
R791		401G6185	1
R403		401G6255	1
R795		40136221	1
ΔR517		40177109	1
ΔR529		40177117	1
R515		40177173	1
R691		40215312	1
R512		40351125	1
R761		40351133	1
R760		40351151	1
R901	R903	40351187	3
R605		40351201	1
R519		40352103	1
R617		40352153	1
R513		40353183	1
R501		40353195	1
ΔR615		40402681	1
R506		40402685	1
ΔR614		40403609	1
ΔR613		40403700	1
ΔR2003		40405109	1
*** CAPACITORS ***			
C608		4201J567	1
C604		4201J575	1
C902		42019625	1
C521		4203J556	1
C512		4203J560	1
C510	C518 C526	4203J567	4
*** CAPACITORS ***			
C703		4203J567	4
C513		4203J569	1
C906		4203J575	2
ΔC602		4209029	2
C403	C409 C709	421C1025	3
C903		4213K207	3
C410	C905	4213K208	1
C708		4213K213	1
C501	C503	4213K215	2
C509	C701	4213K217	2
C751	C791	4213K225	2
C2004		4219J002	1
C711		42399002	1
ΔC514		42702067	1
ΔC522		42705901	1
C404	C507	4275D009	2
C525		4275D053	1
C759		4275D061	1
C506		4275D065	1
C405	C702	4275D074	2
C505		4275D075	1
C515		42760273	1
C504		4279J034	1
C517		42839022	1
C511		4300E116	1
C527	C607	4300E120	2
C606		4300E121	1
C516		4300E125	1
C901		43005126	1
C519		4301A050	1
C407		4301B037	1
C408		4301D101	1
ΔC2001		4301D105	1
C792		4301J018	1
C524		4301J025	1
C414		4301J026	1
C753		4301J030	1
C502	C520	4301J032	2
C707		4301J037	1
ΔC2002	C406 C704	4301J038	3
C705	C710	4301J040	2
C413		4301J042	1
C411	C412	4301J054	2

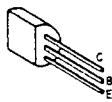
SYMBOL	PARTS NO	DESCRIPTION	QTY
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*** CAPACITORS ***

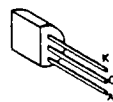
ΔC2003	4301J065	C-ELEC 50V 10UF	1
C491	43019030	C-ELEC 16V 220UF	1
C605	43104076	C-ELEC 180V 470UF	1
C706	43311023	C-ELEC 25V 10UF	2
C402	43515051	C-TANTALUM 16V 2.2UF	1
C401	43515052	C-TANTALUM 16V 3.3UF	2



2SC815
2SC828, 829
2SC838, 839
2SC945
2SC1573
2SA539
2SA733
2SC2002
2SC1318
2SC388A
2SA953

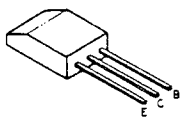


LJ152/JA1050

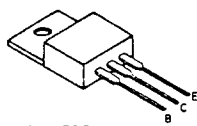


PUT N13T1

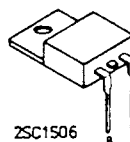
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B: BASE
C: COLLECTOR
K: CATHODE
G: GATE
A: ANODE



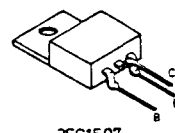
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2SA916



2SC1505
2SD381
2SD401
2SB536



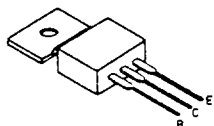
2SC1506
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2SB547
2SD289



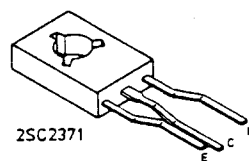
2SC1507
2SB536 (4)



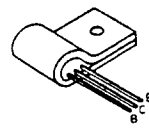
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2SC1106
2SC1114
2SC1325
2SC1358
2SC1456
2SC1891
2SC1104
2SC1185
2SC1875
2SD577



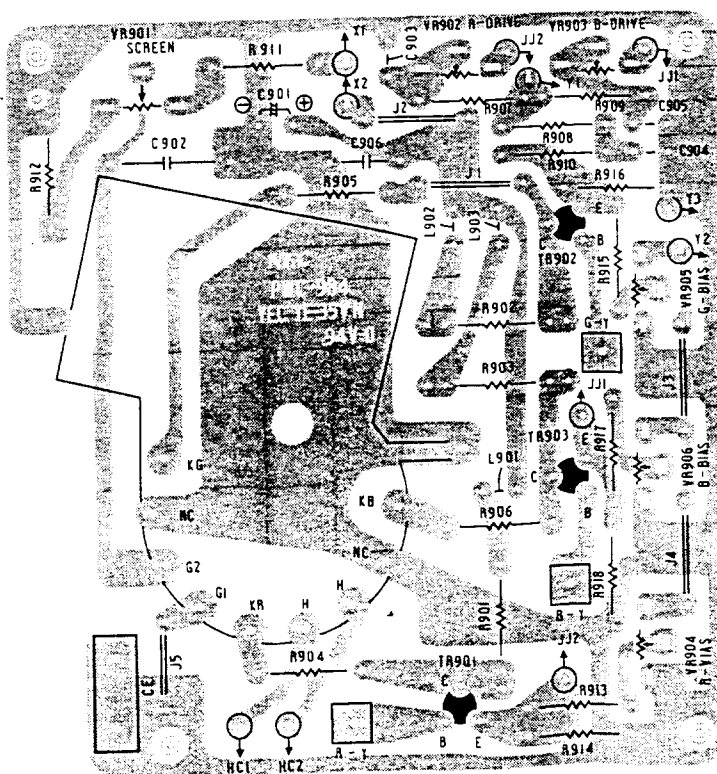
2SC1098
2SA636



2SC2371



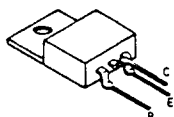
2SA545



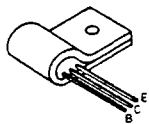
VIDEO CRT PWB
(Solder Side)

MAIN PWB ASS'Y (PWC976)
(Solder Side)

NOTE: E: EMITTER
B: BASE
C: COLLECTOR
K: CATHODE
G: GATE
A: ANODE

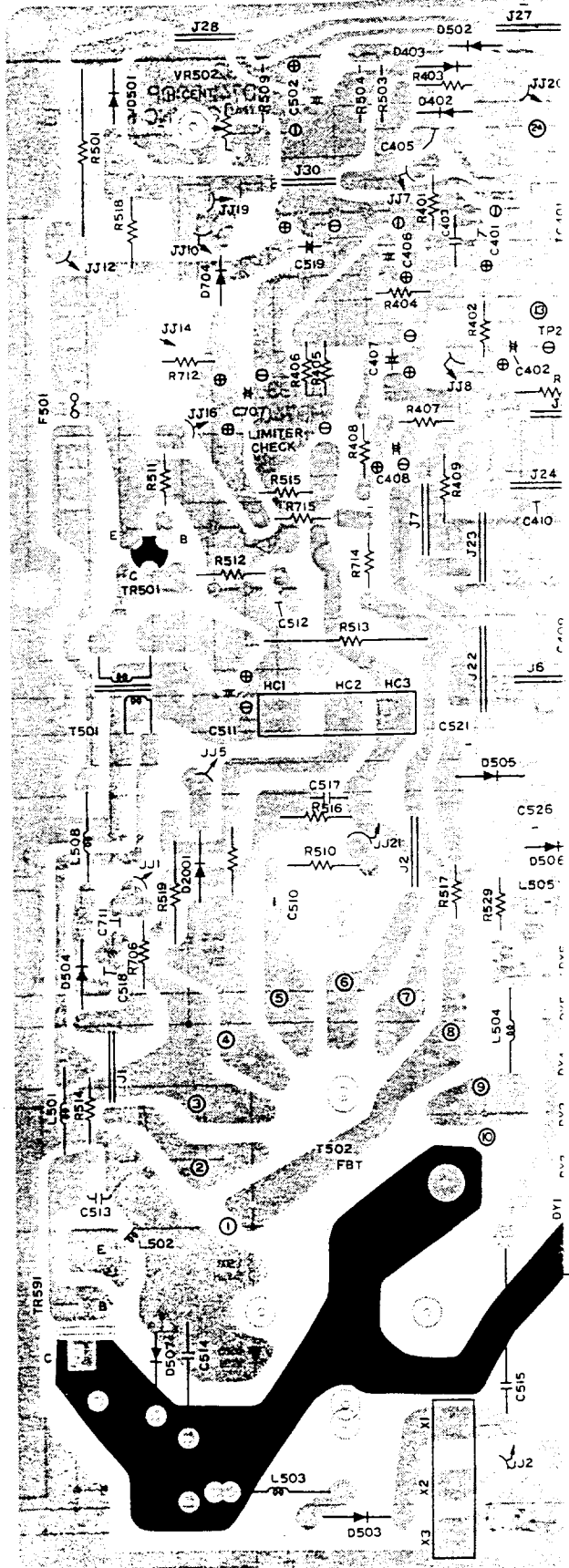
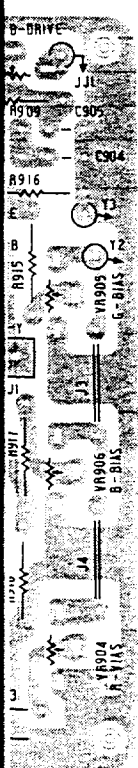


ZSC1507
ZSB536 (4)



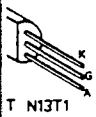
2SA545

VIDEO CRT PWB ASS'Y (PWC984)
(Solder Side)

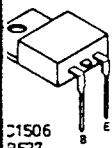


MAIN PWB ASS'Y (PWC976) (Solder Side)

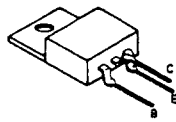
NOTE: E: EMITTER
B: BASE
C: COLLECTOR
K: CATHODE
G: GATE
A: ANODE



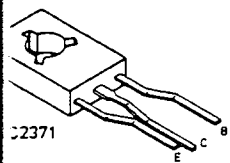
T N13T1



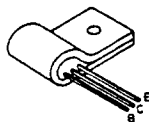
C1506
B537
B547
J289



Z5C1507
Z5B536 (4)

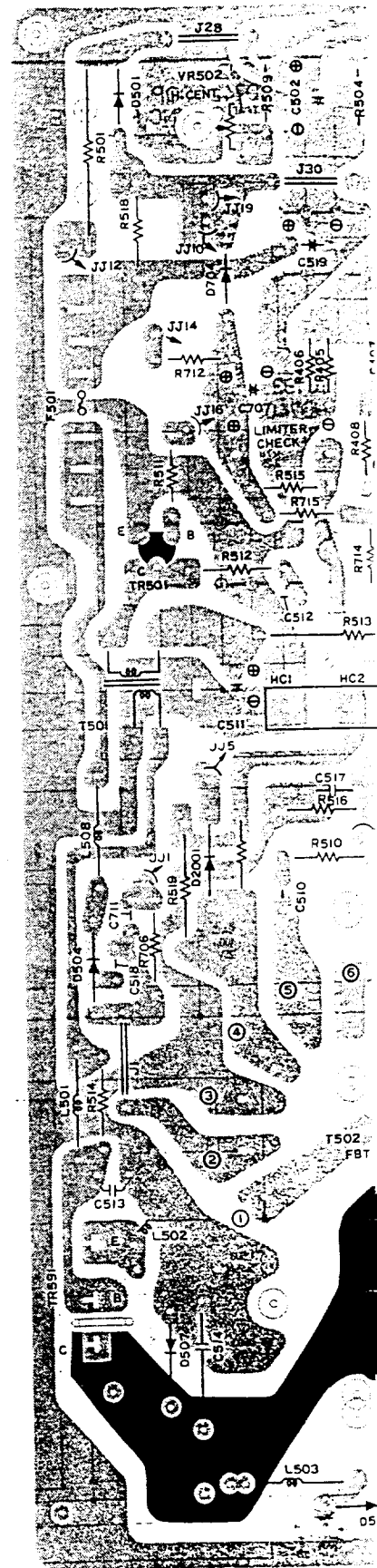
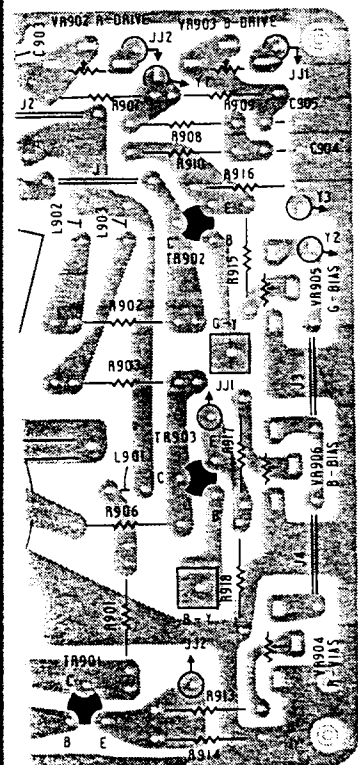


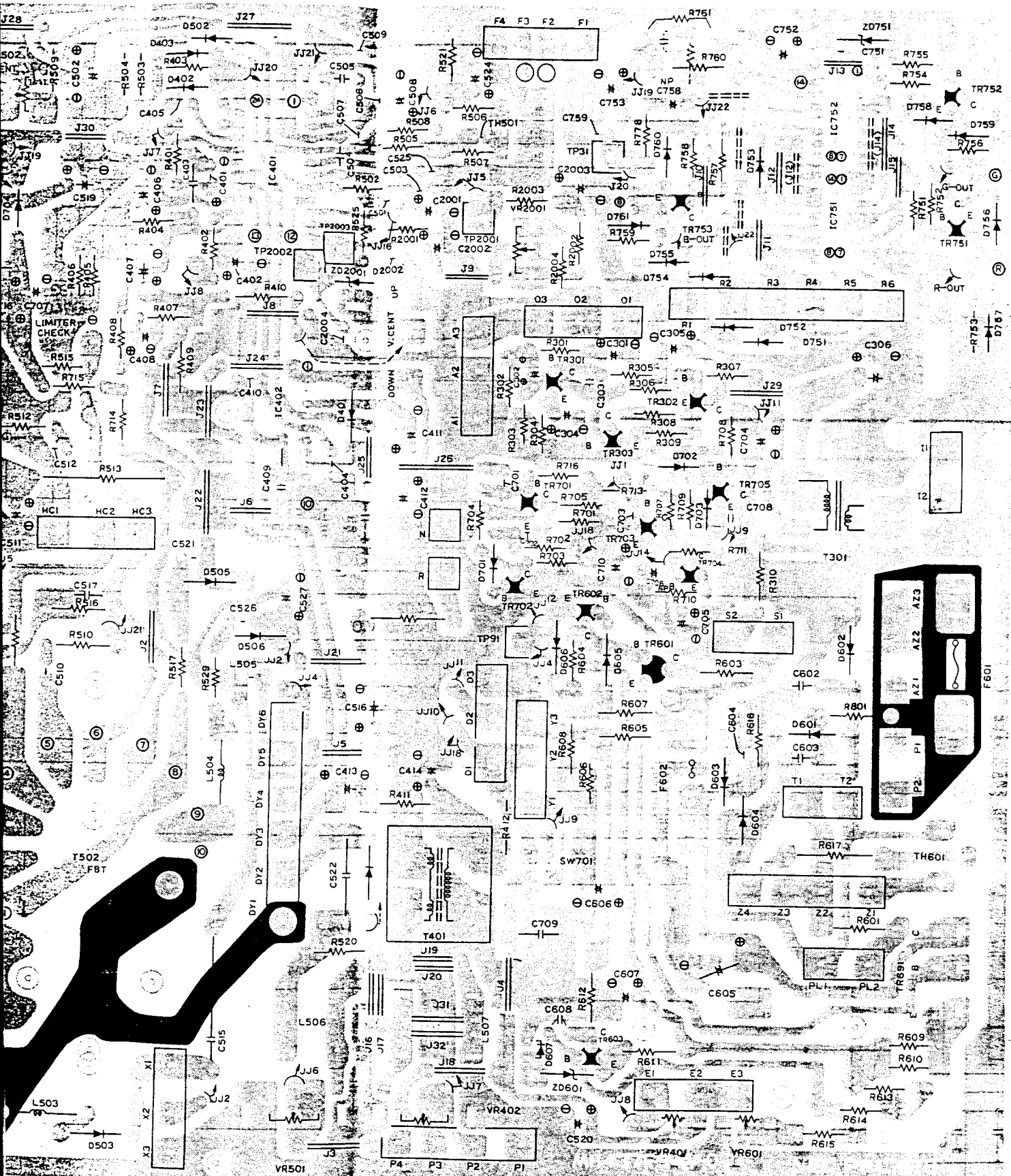
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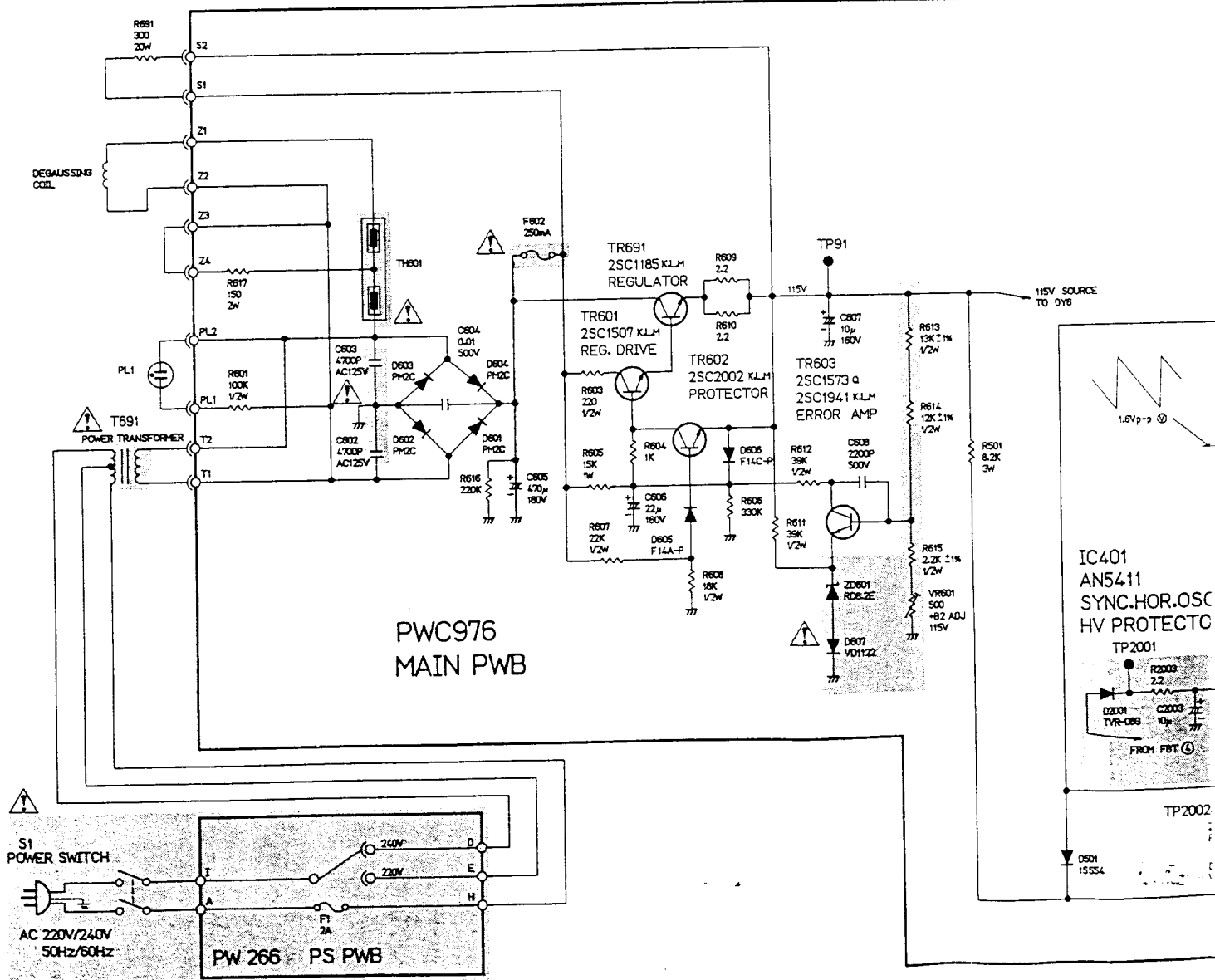
Z5A545

VIDEO CRT PWB ASS'Y (PWC984) (Solder Side)

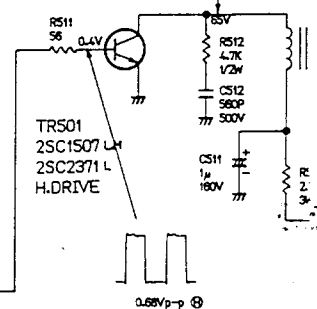
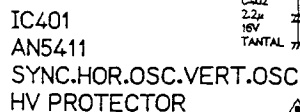
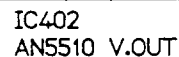
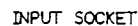


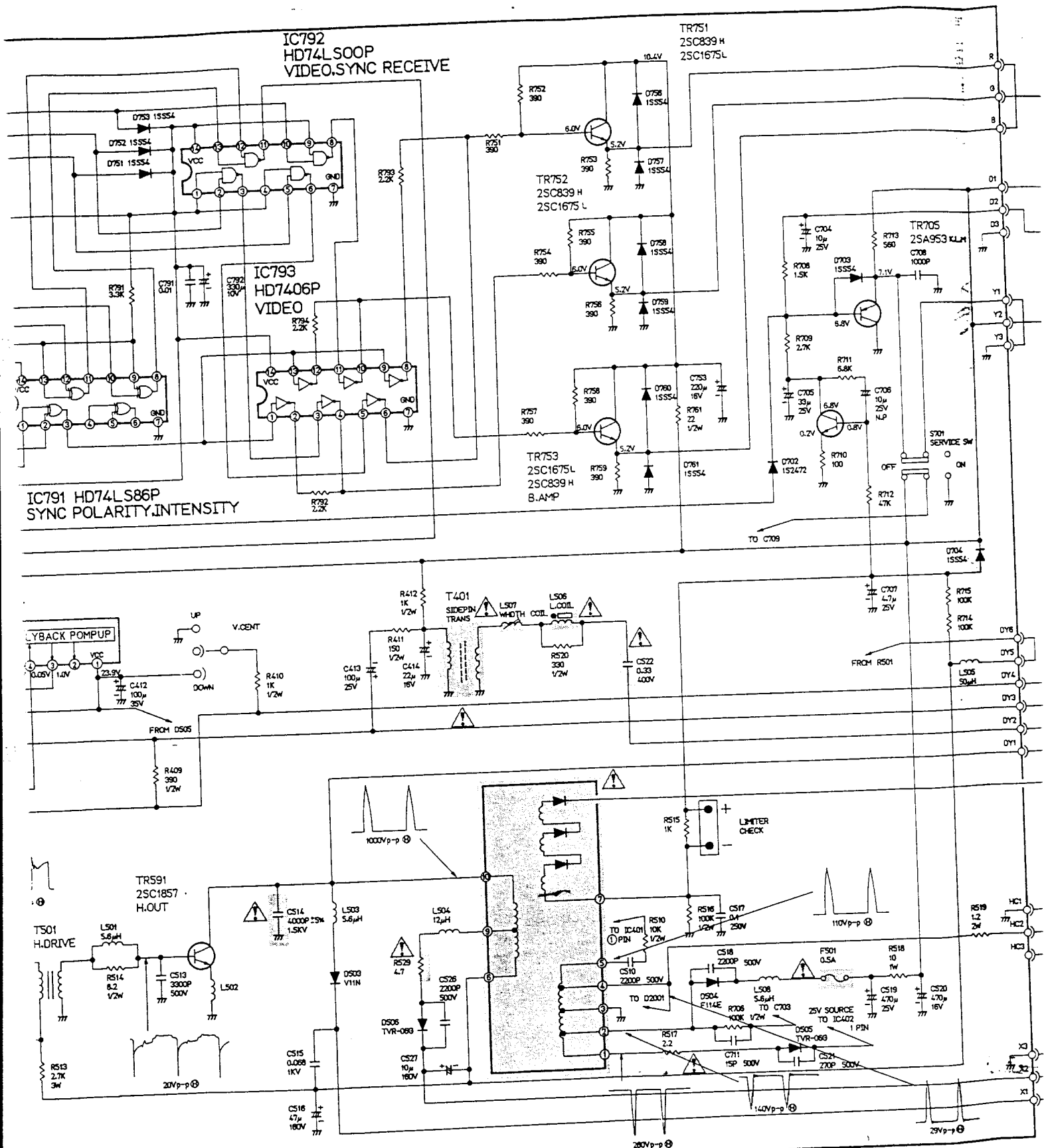


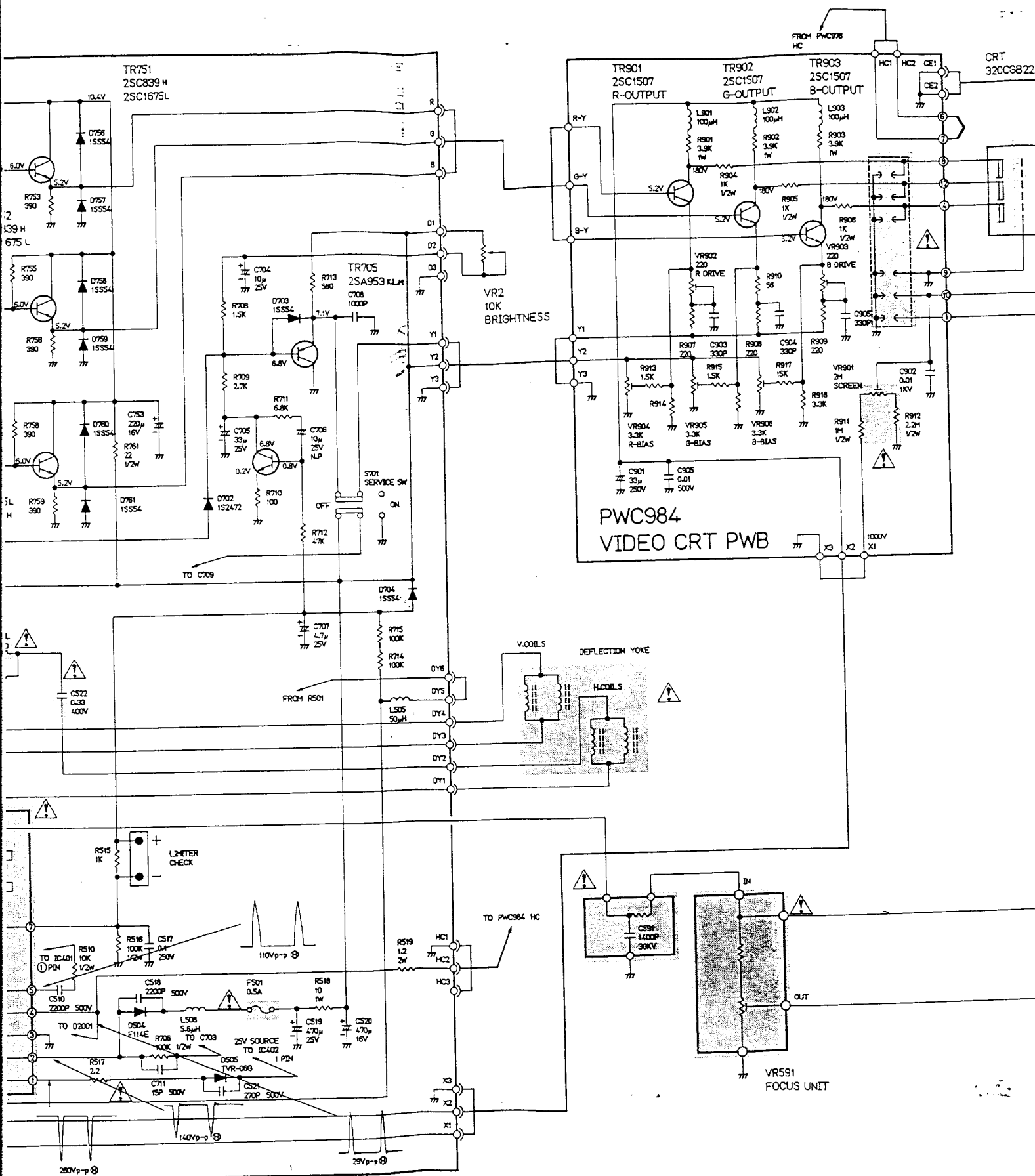
SCHEMATIC DIAGRAM .



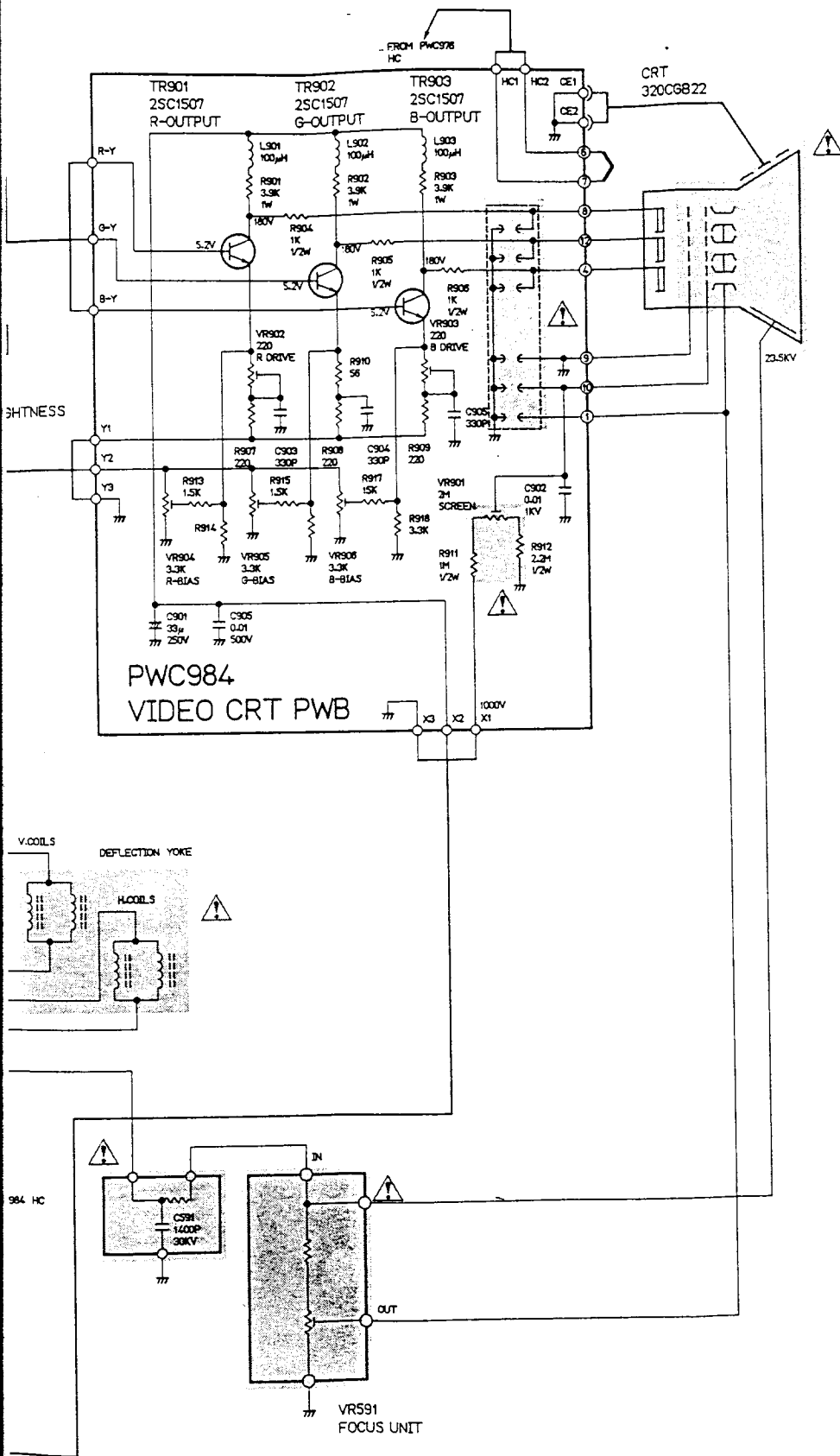
THIS SCHEMATIC DIAGRAM IS FUNDAMENTAL AND SUBJECT TO CHANGE.







SAVE THIS SCHEMATIC DIAGRAM FOR LATER SERVICE



NOTES

1. RESISTOR VALUES ARE IN Ω (OHM) K-1,000Ω M-1,000,000Ω
2. ALL RESISTORS ARE 1/4WATT EXCEPT WHERE OTHERWISE INDICATED.
3. CAPACITOR VALUES ARE IN μF UNLESS OTHERWISE INDICATED. P-
4. ALL CAPACITORS RATE 50VOLTS EXCEPT WHERE OTHERWISE INDICATED
5. WAVEFORMS ARE TAKEN WITH PERSONAL COMPUTER PC-8001
6. ⊕----- HORIZONTAL RATE. ⊕----- VERTICAL RATE.

WARNING

REPLACEMENT PARTS WHICH HAVE SPECIAL SAFETY CHARACTERISTICS ARE IDENTIFIED BY ⚠ SHADING ON THE SCHEMATIC. REPLACE THESE CRITICAL COMPONENTS WITH RECOMMENDED REPLACEMENT PARTS. DON'T DEGRADE THE SAFETY OF THE SET THROUGH IMPROPER SERVICING.

CONTROL(S) MARKED * IS PERMANENTLY FROZEN. DO NOT ATTEMPT TO DEFEAT OR IMPROPERLY REPLACE.

MODEL JC-12030H E
SCHEMATIC DIAGRAM

7816062 □ 3

LOCATION OF CONTROLS

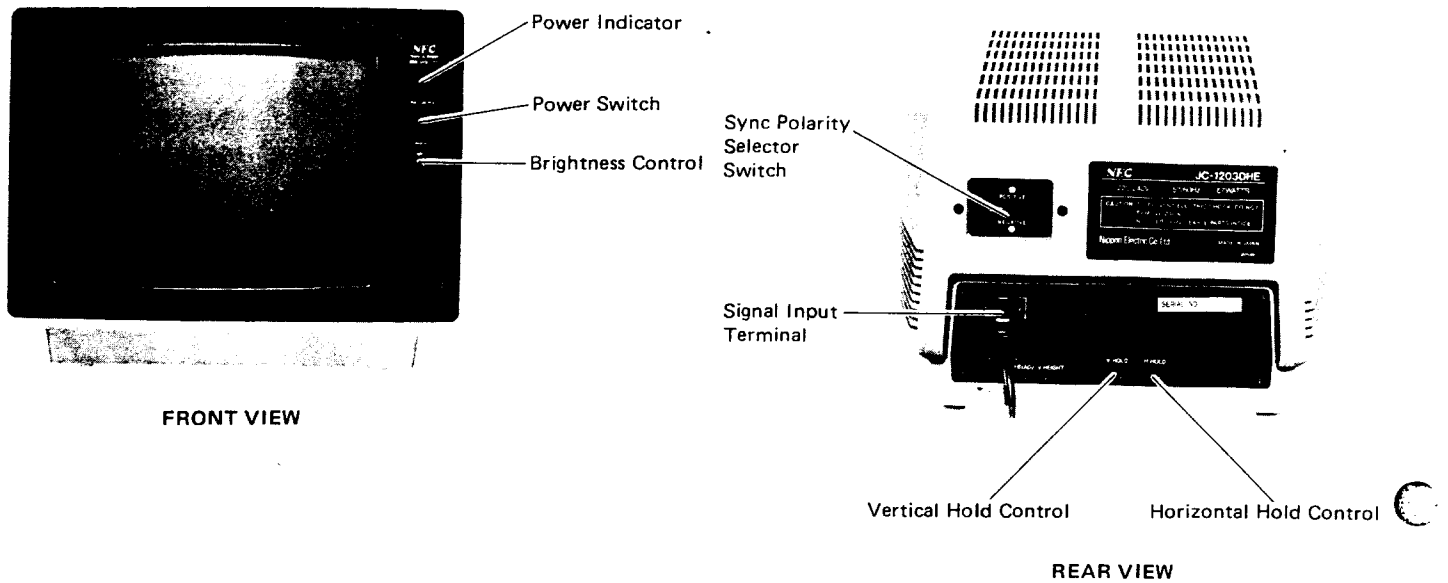


Fig. 1

DISASSEMBLY

BACK COVER REMOVAL

Remove three back cover mounting screws (A), (B) and (C), then take off back cover.

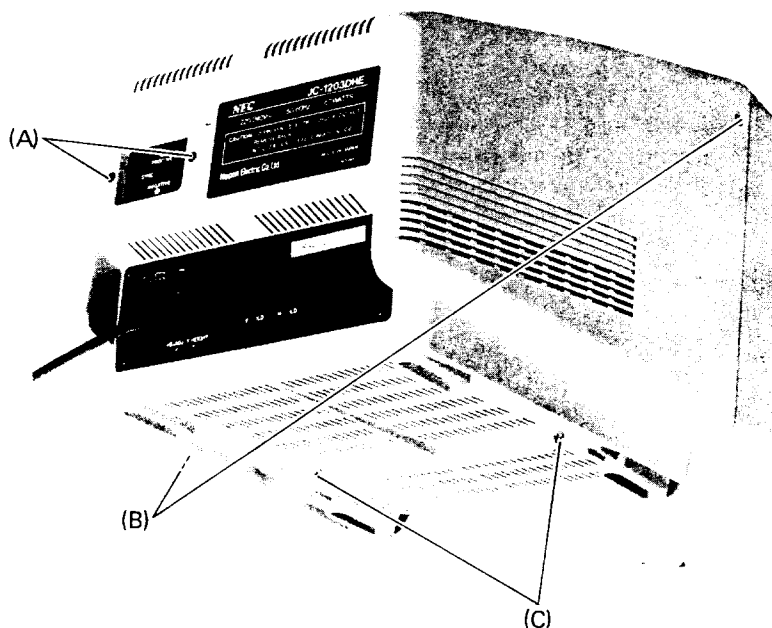


Fig. 2 Cabinet Rear View

PARTS LOCATION

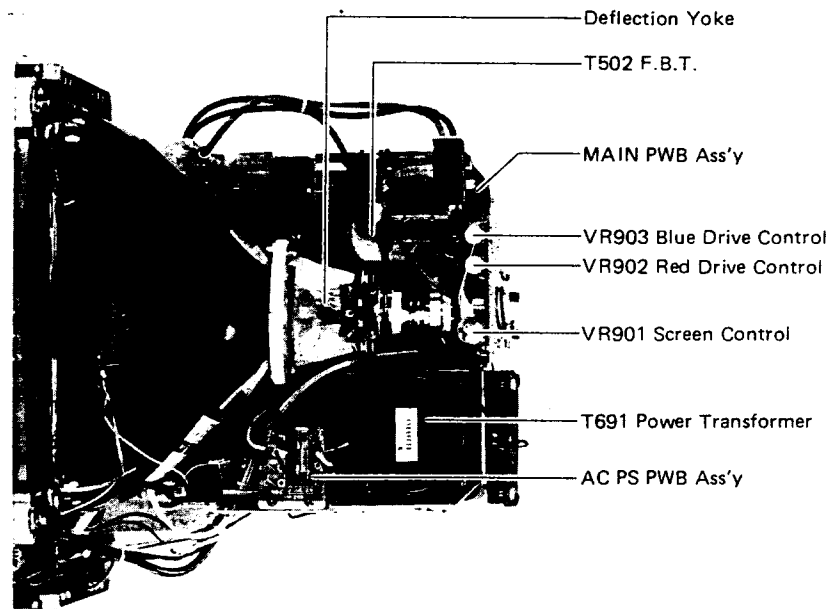


Fig. 3 Top View

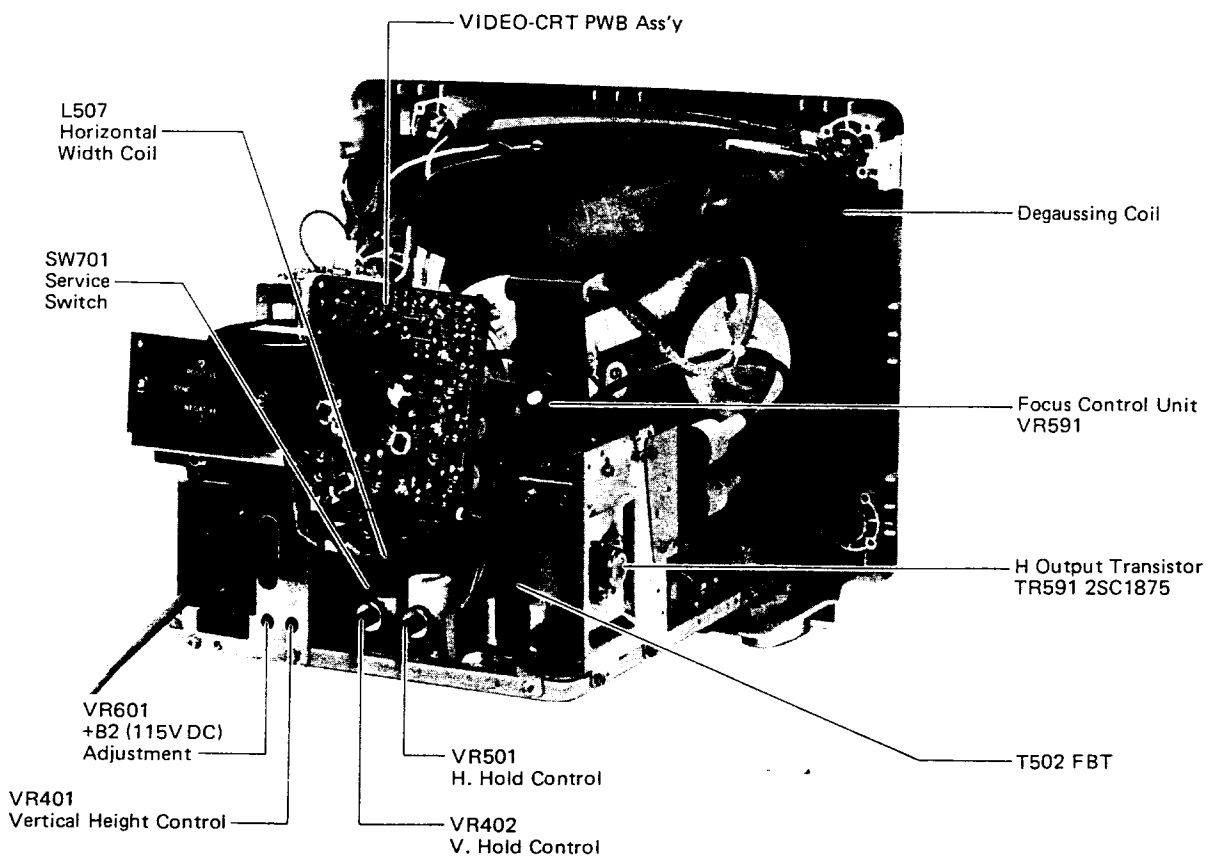


Fig. 4 Rear View

OPERATION OF EACH UNIT

1. Power Switch Knob (PULL ON)

Pull knob to turn display "ON". Power indicator will illuminate. This display is equipped with Quick Start system Picture Tube. The display operates immediately the knob is pulled.

2. Brightness Control Knob (BRIGHT)

This knob, turned clockwise, will make the screen brighter. Adjust the optimum level according to the ambient brightness.

3. Horizontal Hold Control Knob (H. HOLD)

If horizontal stripes are seen in the picture, turn this H. Hold knob slowly and adjust it until the picture becomes stable.

4. Vertical Hold Control Knob (V. HOLD)

If a picture rolls or flips, rotate the Vertical Hold Control to stabilize vertical movement.

5. Input Terminal (8-Pin Socket)

This is used as the input terminal. An 8-Pin connector cable (optional see Fig. 8) must be used for connection.

6. Sync. Polarity Selector

Select position "Negative" or "Positive" of Sync. Polarity Selector. The polarity of sync signal output is different for each type of computer or other equipment.

ex. NEC PC-8001B : Negative

IBM Personal Computer : Positive

7. Intensity Control

The Intensity control signal is applied to Pin #1 of the 8-Pin connector.

The brightness of screen is high when the intensity control (TTL Level) input is "High" or "Open".

The brightness of screen is low (gray) when the intensity control input is "Low" or "Grounded".

8. Use the 60 Hz (16.67 ms) vertical frequency when vertical resolution of 240 lines is sufficient.

If vertical resolution of 280 lines is required, use the 50 Hz (20.0 ms) frequency.

The vertical hold is factory-preset at 60 Hz. Therefore, both vertical hold and vertical height must be readjusted when you operate at the 50 Hz vertical frequency.

Note 1. For normal use of displayed character or 8-color displayed graphics, Intensity control input should be "high" or "open-No Connection".

Note 2. When combined with the IBM Personal Computer, next command should be keyed in immediately after switching the power the IBM Personal Computer "ON". Because initial set up condition of intensity control output is "low", and brightness of screen is "dark", input the command COLOR 15, 0, 0.

HIGH-RESOLUTION COLOR DISPLAY TUBE 320CGB22

The 320CGB22 tube is a 76-degree deflection, 12-inch CRT with a neck diameter of 29.1 mm. Its electron guns are arranged in-line, and it does not require any convergence correction circuit because the guns are of the selfconverging type. The deflection yoke and other neck components are factory-adjusted.

The high resolution of this tube is achieved by increasing the number of phosphor dots on the screen to as many as 2,160,000 and by using high-precision high-resolution guns in the in-line guns. Moreover, a high degrees of brightness and contrast are assured by using a face plate of 85% transmittance over the black matrix screen of negative guard band type.

IMAGE INPUT SIGNALS

The following are the recommendable signal wave patterns and timing charts.

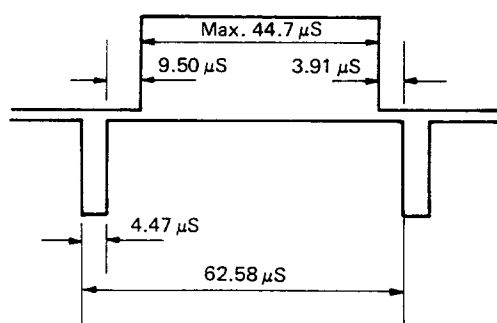
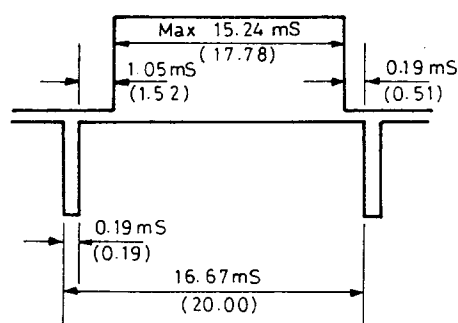


Fig. 5 Horizontal Synchronization



(): 50 Hz operation

Fig. 6 Vertical Synchronization

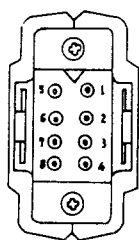
METHOD OF CHANGING LINE VOLTAGE

Power supply is 220/240 volts. This set is factory preset for 220V operation.

If your local power supply is 240V, reconnect the voltage selector tip as described.

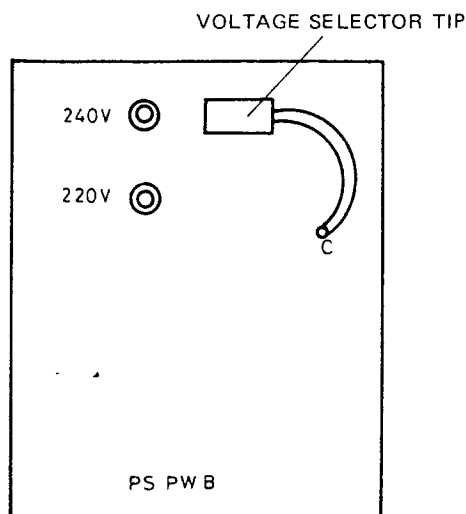
1. Remove the back cover.

2. Disconnect the voltage selector tip from the 220V pin on the PS PWB.
3. Reinsert the voltage selector tip to the 240V pin on the PS PWB.

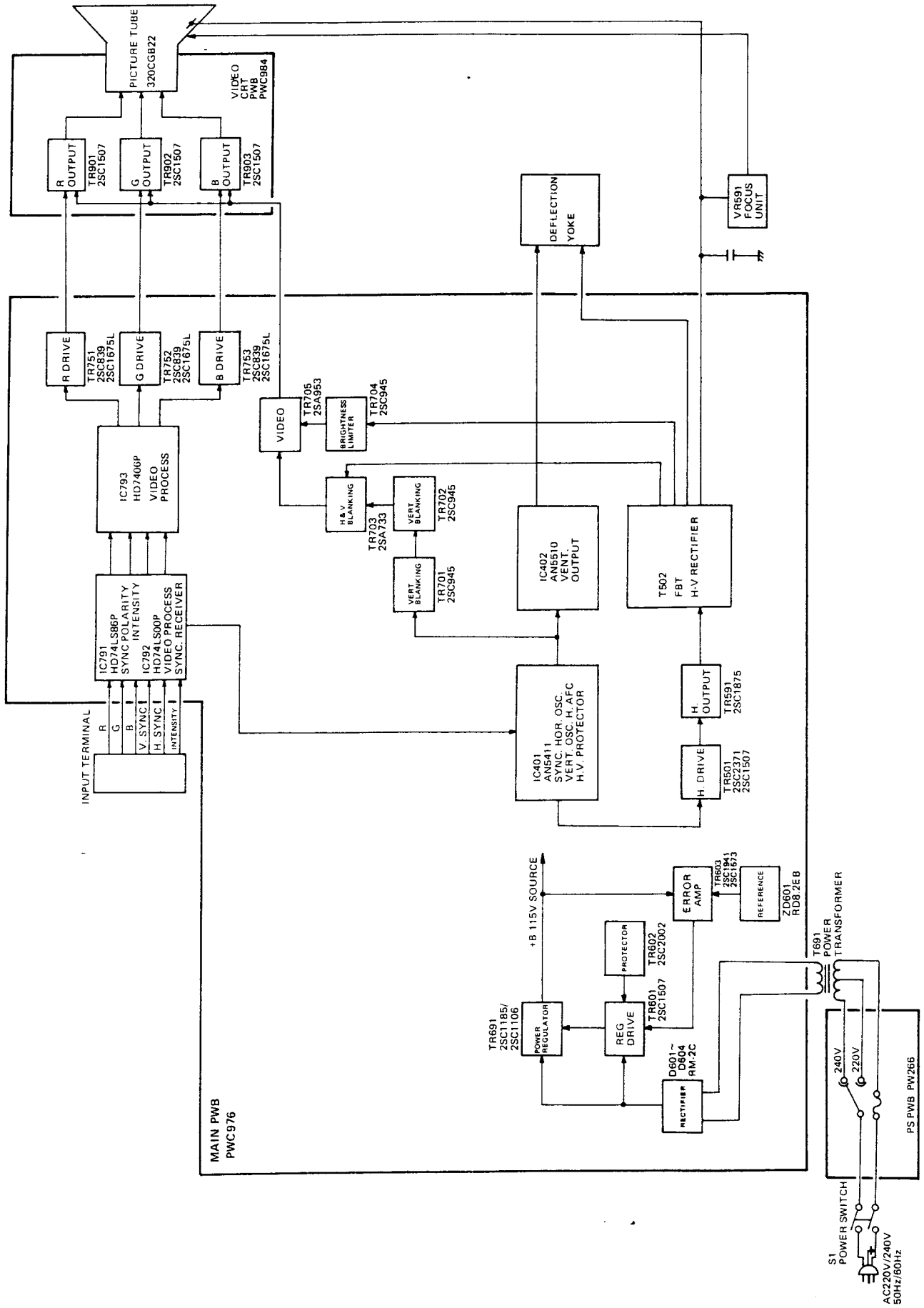


1. Intensity Control Input
2. Red INPUT
3. Green INPUT
4. Blue INPUT
5. GND
6. GND
7. Horizontal Sync. INPUT
8. Vertical Sync. INPUT

Fig. 7 Pin connection of 8-Pin connector cable



BLOCK DIAGRAM



CIRCUIT DESCRIPTION

Note: This is a basic description. Some values and/or circuits may be different in each models.

AC POWER SUPPLY

The AC line voltage is applied to the PS PWB (PWC-266) via terminals D and H, to the power transformer (T691). The power transformer steps down the AC line voltage to 115V for +B and the indicator lights.

A posistor (TH601) is in series with the degaussing coil which is across the AC line. Initially, when the receiver is

turned "ON" and the resistance of the posistor is low, it causes current to flow through the degaussing coil and the demagnetizing action occurs. As the posistor heats, its resistance increases to the point that the current flow through the degaussing coil becomes negligible.

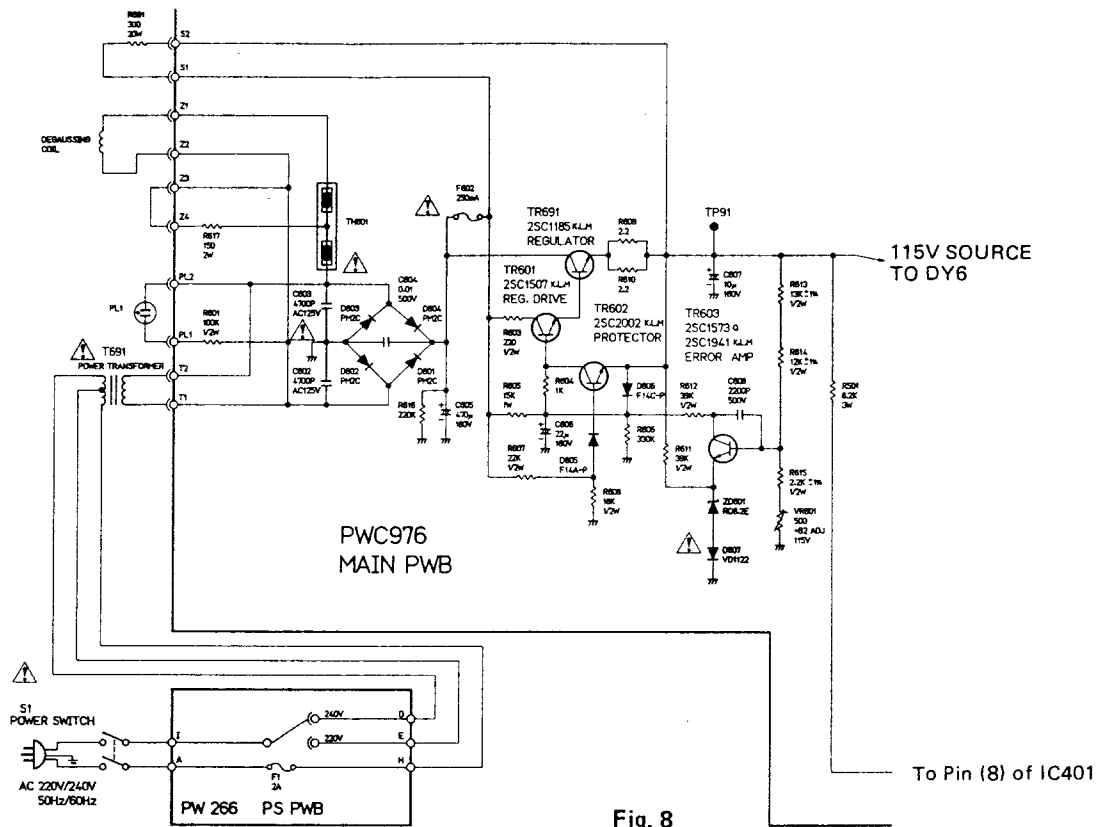


Fig. 8

DC POWER SUPPLY

1. The AC line voltage is applied to connectors "T₁" and "T₂" on the MAIN PWB (PWC-976) from the Power Transformer (T691). The AC line voltage is fed to the fullwave bridge (D601 ~ D604) and filter circuit. The rectified DC output is fed from the filter circuits through the series power regulator transistor (TR691). At the +B output, an electronic ripple filter assures clean DC output. The +B adjustment control (VR601), in the base circuit of the error amplifier transistor (TR603), is adjusted to obtain a voltage reading of 115V DC at terminal "TP91". In the event of an increase or a decrease in the +B voltage at that terminal, the base voltage on TR603 will change resulting in a change of the collector current in TR603. The corresponding change in the TR603 collector voltage is applied to the base of the regulator drive transistor (TR601).

The TR601 is the only path available by which to obtain base bias for the series regulator transistor and control its condition. In the case of a rise in the +B output, the following sequence of events occur. The base voltage of TR603 increases, increasing the collector current and therefore the collector voltage decreases. This decreasing voltage is applied to the base of the regulator drive transistor (TR601), reducing its conduction. TR601 is an emitter follower and when the base voltage decreases, the emitter voltage also decreases. This decreasing of emitter voltage is applied to the base of the series regulator transistor, reducing the current flow through it. The series regulator transistor is also an emitter follower and when its base voltage decreases, its emitter voltage also decreases.